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THE

AMERICAN ARCHITECT

AND

BUILDING NEWS

List 440 +



VOLUME XIX

JANUARY–JUNE

1886

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TICKNOR & CO. PUBLISHERS.
211 TREMONT ST. BOSTON.

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American Architect and Building News.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX	Copyright, 1886, TICKNOR & COMPANY, Boston, Mass.	No. 523.

JANUARY 2, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

BRADSTREET'S Commercial Agency has, during the past year, made an investigation into the cases of "boycotting" by the trades-unions, which has brought out some singular facts. According to Mr. Swinton, who professes to speak for the unions, boycotting is an application of the law as laid down by Moses — "an eye for an eye, and a tooth for a tooth;" or, more definitely, an attempt to take revenge upon certain employers for black-listing their men; but, in point of fact, the worst attacks have been made against persons who have never black-listed any one, but have simply declined to obey the commands of the union leaders, so that his explanation, as is usual with the "explanations" of labor reformers, deserves just about as much consideration as his ethics. The truth seems to be, that boycotting is resorted to at random, whenever any one influential among the union members happens to feel himself aggrieved by some other person, and thinks he can injure him from behind the backs of his fellow-members. The table of statistics which Bradstreet gives, presents a singular picture of these private wars, two hundred and thirty-seven of which have been waged in the country during the past year. The largest number, as might be supposed, have been directed against newspapers, a walking-delegate, surrounded by his abject followers, being as little disposed to bear tamely the disparaging remarks of an editor as a mediæval baron, with his army of slaves and retainers, would have been. The next largest body of victims, excluding the employers of Chinese, is that of the cigar manufacturers, twenty-six of whom were attacked, with varying result. Four tailors, one piano-forte manufacturer, four breweries, three flour mills, five stove-dealers, two publishers and twenty-two hat-dealers, besides many dealers in dry-goods, carpets and clothing, have had the Mosaic law applied to them, and, strangest of all, two postmasters figure on the list. Whether the art of boycotting a postmaster consists in refusing to take letters out of his office, or to put any in, we are not informed; but the boycotting of a postoffice must be one of the most singular spectacles that labor reform has yet furnished to delight amateurs of social science. It is noticeable that no grocery, or "sample-room," or "importer's" establishment has yet been boycotted, so far as the report shows. We find that "a special beverage" has been attacked, and that the struggle still rages; but no indication is given of the nature of the liquid, and we fear that it must be akin to a certain limpid beverage, not a very special one either, which has apparently been boycotted for several years past by one or two labor unions that we know of.

A RATHER suspicious story comes from Chicago, about a picture, said to be by Raphael, which a certain rascal, to judge him by his own account of himself, as reported in the daily papers, brought over recently with him in the steerage of a ship from Europe. According to the story, or rather, selecting from the different versions of it, this individual, who is now cook in a Chicago hotel, was once a furniture dealer in Paris. While engaged in this business a Benedictine monk, with two companions, brought a little picture, eighteen inches by thirty, which, they said, was the "original Virgin and the Book," by Raphael; and they exhibited documents to prove its authenticity, asserting that the picture was worth one hundred thousand dollars. The furniture-dealer, whose name is said to be Keiffer, consented to place the picture on sale in his store. While there it was seen by "the keeper of a fashionable café," who — gentlemen of this profession being, apparently, in Paris, as in New York, conspicuous amateurs of high art — offered sixty thousand dollars for it. This offer was refused, because one of the companions of the Benedictine monk, named "Monasco," demanded too large a share of the money. Monasco then carried away several pictures which formed part of Mr. Keiffer's stock, to sell on commission, but failed to return them, and Keiffer kept the Raphael as security for them. While the pair were disputing over this matter, Keiffer became bankrupt, and his creditors, having apparently overlooked the hundred-thousand-dollar picture among his assets, he packed this up, together with his household baggage, and took steerage passage for New York. The household effects of emigrants enter the United States free of duty, and Keiffer brought his feather-beds and his picture safe to Iowa, where he had a brother living. Having been imprudent enough to show his treasure to his brother, the latter took the first opportunity to steal it, and carry it to Chicago for sale. Keiffer hurried after him and had him arrested, and recovered the picture, which he put away in a safe place until an "art reception" of the Calumet Club afforded him an occasion for exhibiting it to an appreciative and rich public. Unfortunately for him, however, the picture attracted the attention of the custom-house officers, as well as the Calumet Club amateurs, and he was summoned to pay duty upon it; and on his failure to do this it was seized by the United States officers, in whose custody it still remains.

WE must confess that the whole affair looks to us like a gross and clumsy imposture. The "Benedictine monk," with his friend "Monasco," are stock figures in the farce which is so often played before credulous picture-buyers abroad, and the "parchment document in Raphael's handwriting," with the "seal of Pope Clement XIV," which are said to be attached to the back of the painting, are ordinary properties in the same farce. Here, however, all trace of any cleverness in the deception ends. It is unnecessary to say that a picture by Raphael could hardly come into the hands of a Benedictine monk without his stealing it; and to place a stolen Raphael on public exhibition in Paris, under its real name, would be to invite certain investigation and punishment. The tale about the refusal of the café proprietor's offer of about twice what the picture would be worth if it were really what it pretended to be, is scarcely more ridiculous than that of the escape of Keiffer on an emigrant ship with a valuable piece of property, to which all his creditors, to say nothing of the monk and his two friends, had a valid claim; and the purloining of the picture in Iowa, with the owner's chase after it, are apparently nothing but portions of a trick for advertising it. Clumsy as the execution has been, the scheme certainly seems to have worked well. The Chicago custom-house officers, who, as is well known, are consummate judges of cinque-cento painting, pronounce the picture to be "worth seventy-five or eighty thousand dollars," and Keiffer, who has, no doubt, some customer in view, professes to be willing to pay duty on a valuation of thirty thousand dollars, although he claims that, as a portion of his "household effects," it ought to be admitted free.

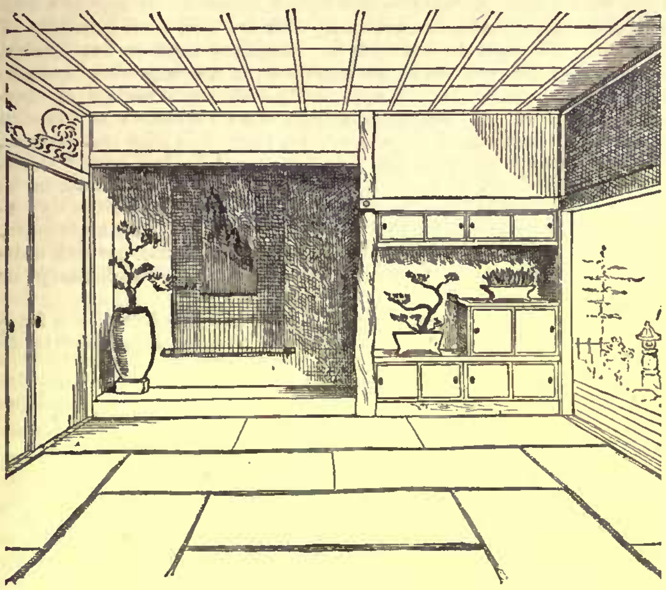
THE people of Paris have been rather disagreeably surprised recently to find that their idolized city has, of late years, lost something of its old attraction, and that the population is now actually less by about one hundred and fifteen thousand than it was in 1881. All the other large cities in the world, with hardly an exception, have gained in

population during this period, while the most famous and fascinating of all has been losing at a rate which, if maintained, would leave it without a single inhabitant within the lifetime of many who are now looking out upon its bright and crowded streets. Whether this movement out of the metropolis of the world is a result of the disastrous labor disputes that have raged there for ten years past, or of a sudden epidemic longing, on the part of the Parisians, for green fields and country air, or of the decentralization which would, perhaps, naturally follow the assumed establishment of the Republic and the wane of the social and administrative traditions of the empire, or to a combination of all these causes, we will not pretend to say; but an unmistakable indication that the movement, whatever may be its cause, is not yet over, is to be found in the account of some recent sales of real estate, which we find reported in *Le Génie Civil.* Our readers know that, four or five years ago, some of the finest streets in the new quarter of Paris were the scene of extensive building speculations. Rows of handsome houses and apartment-hotels were built and offered for sale, in vain, and there are still, it is said, whole streets, lined with beautiful houses, which have not an inhabitant from one end to the other. Of course, scores of builders went into bankruptcy; the mortgagees took the houses they had built, and the speculation ended in a general liquidation. Recently, however, the owners of this costly property have taken heart, and have offered their houses again for sale. In many cases the sales have been made by auction, under the direction of the mortgagee, but, although such sales are generally much more popular and successful than foreclosure sales with us, the results quoted give very little encouragement to owners. Taking, as a sample, the transactions of the three weeks from the fifteenth of October to the seventh of November, it appears that ninety-one such sales were made of property in Paris. In most of these cases an upset price is fixed, usually either by the mortgagee or by the original owner of the land, who, in his anxiety to effect a sale of his land to the speculating builder at a good price, often guarantees the mortgage debt. The rule is, as we understand it, that the creditor who thus fixes the upset price, which he would hardly be likely to set at a sum greater than the amount of his interest in the estate, becomes the purchaser at that price, if no higher bid is received; and it is curious to observe that, upon nearly two million dollars' worth of property absolutely transferred, the total excess of the selling amounts over the upset prices was a trifle over sixty-six thousand dollars, or about three and one-half per cent. To put it in another way, the original owner of the land, and the mortgage creditors, after consulting together as to what sums they would now be willing to take for their interests in the property, without regard to any claims of the builder and his creditors, found that they could only get for the estates, on an average, three and one-half per cent more than what remained after sacrificing the whole of the builder's interest, and probably a considerable part of their own. In fact, many of the best houses were sold for less than half, and some at less than one-third, of the cost of the buildings alone, with nothing for the value of the land, and were bought at that price by the mortgagees, who, although the houses are new, and among the most beautiful and perfect in the city, will be obliged to carry them for an indefinite period without tenants. According to the figures given in the account, houses which cost at least twenty-four dollars a square foot for construction alone, were sold at seven, eight, nine and ten dollars, including the land. The editor of *Le Génie Civil* remarks that these sales seem to him to indicate that this is a good time to buy real estate in Paris, and his opinion is certainly a sensible one. Many millions of dollars of foreign money are invested in buildings and land in New York, Chicago and other large cities here, and, even under present circumstances, we are inclined to think that Americans who are troubled with an excess of idle money, might do much worse than use it in buying up, perhaps with some concert of action, a number of these unfortunate Parisian palaces.

IT is soothing, after the mistakes that have been made in the past by some of our foreign contemporaries in attributing to other sources the work of American architects, to find the *Builder*, in a recent issue, paying an indirect compliment to American architecture of the present day. To be sure, it is not a high form of praise to say that, if certain very unflattering things could be truly said of our architecture a quarter of a century ago, such "criticism has to be revised now;" but we are quite accustomed to the attitude of English critics — both those who come to see for themselves, and those who do not think it worth while to do even that — towards the inhabitants of this country and their doings and sayings. The *Builder* finds an excuse for throwing us this crumb of comfort in the publication, which it makes, of four of the plates which form part of the "*Monograph*" of the Harvard Law-School Building. These prints, which are reproduced by the "ink-photo" process, which is similar, but in some ways better, than our own photo-caustic process, are — or at least one of them — among the best results yet accomplished by any of the similar reproductive processes, which are, by necessity, compromises between the requirements of art and the exigencies of commerce. As the *Builder* states that it will be "very glad to see more such monographs," we may express the hope that, if it finds in succeeding "*Monographs*" material of interest enough to treat in the same way, it will not deprive our publishers of their just right to benefit by again omitting the usual foot-note, stating the title of the publication and the name of the publisher. To say that the plates were reproduced "by permission" is not just the way to excite the gratitude of a publisher who sends a book across the Atlantic for review.

THE Reverend William C. Winslow, the Treasurer for the United States of the Egypt Exploration Fund, writes to the Boston *Advertiser*, describing the interesting objects which have been sent to the Museum of Fine Arts in Boston as the American share of the antiquities so far discovered by the expedition sent out under the auspices of the Fund. The English members seem to have been generous in their division of the common property, and Boston now possesses a number of Egyptian antiquities which are the only ones of the kind in any museum in the world. The more interesting of these on some accounts are two iron knives, the only iron articles of any kind, we believe, which have ever been found in Egyptian excavations. It is known that copper, or bronze, was almost invariably used for cutting tools, and the Egyptians of antiquity are usually thought to have been ignorant of iron, or, as some say, to have had superstitious objections to using it. These knives, which probably date from a period before the conquest of Egypt by Alexander the Great, show that iron was not unknown to the Egyptians of that time, although they may not themselves have made them. Another curious object sent to Boston is the bronze window-lattice which was found in the treasure-city of Pithom, and with it comes the dress of the woman whose embalmed remains were found near Zanis. This dress, which is perhaps the oldest piece of figured material in the world, is woven with an antique pattern, of Persian character, but in bright and well-preserved colors. As the Egyptian mummies are usually wrapped in white linen, it is thought that this woman must have come from Syria, which was celebrated in antiquity for its manufacture of figured cloth, and that she was buried in the garments characteristic of her country. For some reasons this discovery is of particular importance, not so much on account of its value in Egyptian archæology as for the evidence which it may give as to the relationship of the Syrians of the present day with those who three thousand years ago made its rocky coasts the most famous portion, next to Egypt, of the world. The persistence of habits and traditions among illiterate races is almost incredible. To this day the Egyptians show a special deference for cats, which they explain by saying that Mahomet was fond of these animals, without suspecting, probably, that the traditions handed down from their ancestors, who worshipped cats as the incarnation of the moon-goddess; and we have seen that the modern Greeks still put money into the hands of their dead friends to pay their fare to the land of shadows. Syria, and still more the country to the north of it, have been for many ages undisturbed by any great conquest or emigration, as well as isolated from the rest of the world; and when those regions are opened to free exploration it is by no means unlikely that the patterns of their rugs and embroideries, for which they are still as locally famous as they were three thousand years ago, may be found to have descended almost unchanged from the remotest antiquity.

JAPANESE HOMES AND THEIR SURROUNDINGS.[1]

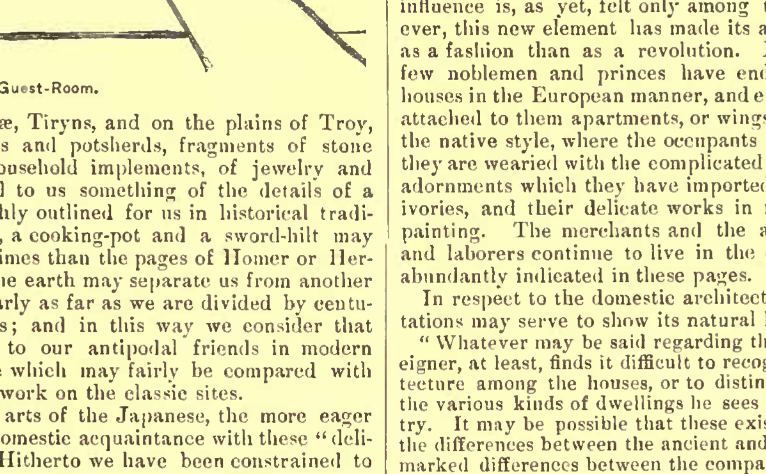


A Guest-Room.

IF the excavations at Mycenæ, Tiryns, and on the plains of Troy, have given us only shards and potsherds, fragments of stone sculpture, of arms and household implements, of jewelry and ornaments, they have revealed to us something of the details of a civilization hitherto only roughly outlined for us in historical tradition and epic story. In fact, a cooking-pot and a sword-hilt may bring us nearer to the heroic times than the pages of Homer or Herodotus. But the diameter of the earth may separate us from another family of the human race nearly as far as we are divided by centuries from the pre-historic eras; and in this way we consider that Professor Morse, in relation to our antipodal friends in modern Japan, is rendering a service which may fairly be compared with that of Dr. Schliemann in his work on the classic sites.

The more we know of the arts of the Japanese, the more eager we are for a closer and more domestic acquaintance with these "delicate children of the spirit." Hitherto we have been constrained to content ourselves with such dim and unsatisfactory ideals of their daily life as we have been able to evolve out of their pictured fans and fabrics, their laquers, porcelains and bronzes. Professor Morse has substituted realities for ideals in his curious book on Japanese homes, and yet we are not disappointed. It not only justifies our preconceived notions of the genius of this singular people, but throws new light upon it from an unexpected source.

No one could have presented himself more completely equipped for this special service than our author, in respect both to natural qualifications and to the good fortune of experience. He has brought to the task a spirit of catholic sympathy, an indefatigable patience of investigation, a clear head, a mind full of frankness and good humor, and, not least, the hand of an accomplished artist in graphic delineation. In this latter regard, one might almost say, he stands to modern Japan as Viollet-le-Duc to mediæval France. No architect needs to be told that this is high praise. His quick pencil has traversed the whole domestic field, from house and garden, to kettle and candlestick, with equal fidelity and skill. His enthusiasm has a communicating quality, which often betrays us into sympathy with the most humiliating comparisons between our own complicated and entangled conditions of life, and the clean, pastoral simplicity of the Japanese home. Something of exaggeration may be pardoned to a zeal so vigorous, if only it brings us to a realizing sense that we are not on the top of civilization in all the details of living.



Country Inn in Rikuzen.

This book deals not with the conditions and characteristics of the higher and finer arts of Japan, and the manner in which they have been transmitted and preserved through traditionary handicrafts — a subject which, we trust, Professor Morse will yet undertake, but with common things only, the dwellings of the middle classes and of the poor; yet it is interesting to note that the general impression left upon the mind of one who has studied these pictured pages with care, is that these simple domestic details have a common origin with the most exquisite and patient productions of Japanese art. It is apparent that, in the planning, construction, furnishing and decoration of the humblest houses, in the laying-out, planting and enclosing of the little gardens which are always attached to them, there is a fundamental difference between our own methods and theirs, which indicates that these things are a growth out of, and an adaptation to, a simpler and more gentle life, and one of far greater natural refinement and innocence than that of the corresponding classes in our own country. These details will prove useful to us, not so much because they add very materially to our resources of design or to our stores of practical knowledge in the art of building — though they are not without suggestions of great value even in these respects — but because they show very clearly what may result when an industrious and ingenious people unconsciously develop, through many generations, indigenous arts absolutely free from affectation or masquerade. Their traditions have remained singularly pure and unsophisticated, and their progress from century to century has been almost imperceptible, but less through Oriental inertness than through their ancient policy of national isolation. Since they have opened their ports to foreign commerce, and their methods of life to the influence of foreign civilization, the arts of the Renaissance have begun to corrupt the native stream; but this influence is, as yet, felt only among the higher classes, where, however, this new element has made its appearance, rather, apparently, as a fashion than as a revolution. Mr. Morse tells us that only a few noblemen and princes have endeavored to build and furnish houses in the European manner, and even these houses generally have attached to them apartments, or wings, constructed and furnished in the native style, where the occupants may live their natural life when they are wearied with the complicated and elaborate conveniences and adornments which they have imported in exchange for their curious ivories, and their delicate works in metal, embroidery, carving and painting. The merchants and the artisans, the farmers, mechanics and laborers continue to live in the old way. What this way is, is abundantly indicated in these pages.

In respect to the domestic architecture of the Japanese these quotations may serve to show its natural limitations: —

"Whatever may be said regarding the architecture of Japan, the foreigner, at least, finds it difficult to recognize any distinct types of architecture among the houses, or to distinguish any radical differences in the various kinds of dwellings he sees in his travels through the country. It may be possible that these exist, for one soon gets to recognize the differences between the ancient and modern house. There are also marked differences between the compact house of the merchant in the city and the country house; but as for special types of architecture that would parallel the different styles found in our country, there are none."

"The Japanese dwellings are always of wood, usually of one story and unpainted. Rarely does a house strike one as being specially marked or better looking than its neighbors; more substantial, certainly, some of them are, and yet there is a sameness about them which becomes wearisome. Particularly is this the case with the long, uninteresting row of houses that border a village street; their picturesque roofs alone save them from becoming monotonous. A closer study, however, reveals some marked differences between the country and city houses, as well as between those of different provinces."

"In connection with the statement just made, that it is difficult to recognize any special types of architecture in Japanese dwellings, it may be interesting to mention that we found it impossible to get books in their language treating of house architecture. Doubtless books of this nature exist; indeed, they must exist; but though the writer had a Japanese book-seller, and a number of intelligent friends among the Japanese, looking for such books, he never had the good fortune to secure any. Books in abundance can be got treating of temple architecture, from the plans of the framing to the completed structure; also of *kura*, or go-downs, gateway, *tori-i*, etc. Plans of buildings for their tea ceremonies, and endless designs for the inside finish of a house — the recesses, book-shelves, screens, and, indeed, all the delicate cabinet-work — are easily obtainable; but a book which shall show the plans and elevations of the ordinary dwelling, the writer has never yet seen. A number of friends have given him the plans of their houses as made by the carpenter, but there were no elevations or details of outside finish represented. It would seem as if, for the ordinary houses, at least, it were only necessary to detail in plan the number and size of the rooms, leaving the rest of the structure to be completed in any way by the carpenter, so long as he contrived to keep the rain out."

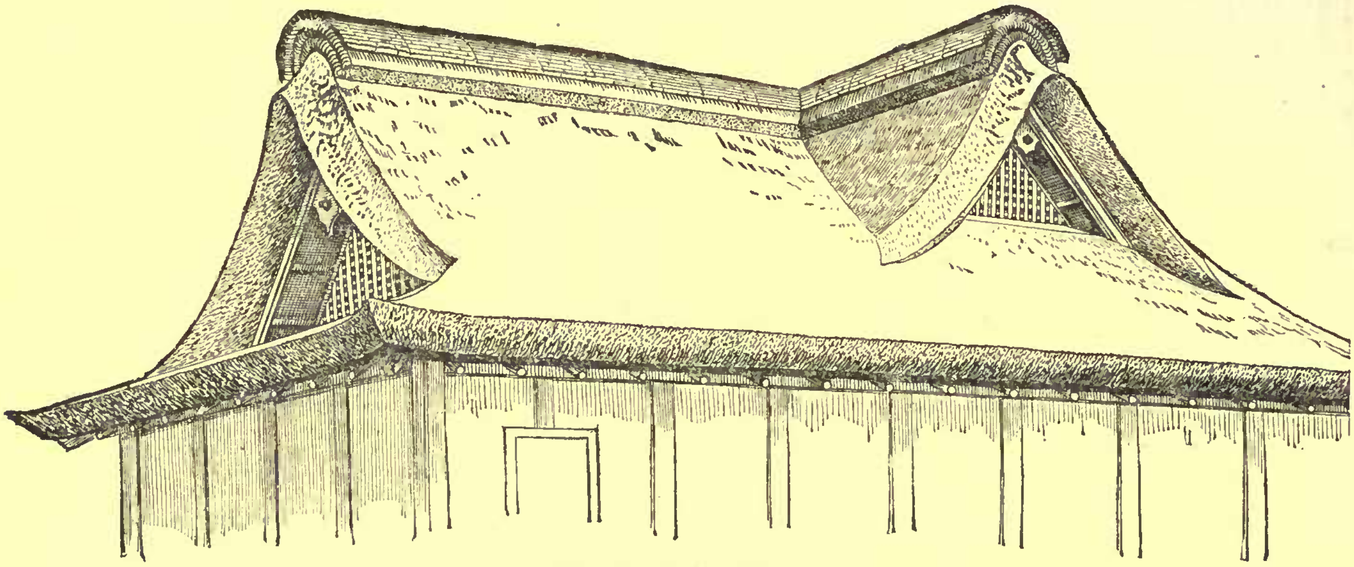
We thus have to deal rather with dwellings than with architecture; and this brings us into closer contact with the domestic manners and customs of a people who have not been tempted to affect

[1] "*Japanese Homes and their Surroundings*" by Edward S. Morse, late Professor of Zoology, University of Tokio, Japan; with illustrations by the Author. Ticknor & Co. 1886.

emotions which they do not feel, to use forms of building which have not grown out of the necessities and conveniences of life, or to indulge in styles of interior decoration which are not delicately adjusted to their social condition.

Their common methods of construction and framing are portrayed with great clearness, and our own builders might study with profit the precision and neatness of their joinery, their judicious economy in the use of materials, their curious methods of sheathing-in ceilings, and of tiling on outside walls and roofs; their shingling is poor and ineffective, but their thatched roofs are always picturesque and often beautiful.

In the interiors the constructive features are always frankly apparent, and the builders are fond of leaving the bark exposed on their larger timbers. A part of the outside walls and all the partitions are of light framework, covered with stout paper; these are made to slide in grooves, and are easily removed so as to throw adjoining rooms together. The module of dimension in planning is the floor mat, which is of definite size, and the dimensions of the apartments are designated by the number of mats which can be adjusted to the floors. These apartments, to the European eye, are singularly bare: there is practically no furniture on the floors, no picture on the walls, save an occasional painting attached to the frieze, or a long and narrow strip of pictured cedar hung to the partition post. But every Japanese house has two adjoining shallow recesses in the principal room, the *tokonoma* and the *chigai-dana*. The former is reserved for the display of works of art or ornament — a painting on the wall, and a vase with flowers on the raised floor. The latter is fitted with irregular shelves and cupboards, more or less decorated. These are shown by example in the initial-cut to this article. Works of art and value are stored in the *kura*, a fire-proof building, which forms a conspicuous member in every group of domestic buildings of the better sort. Its artistic contents are never spread indiscriminately for display in our fashion, but take their place one after another in the *tokonoma*, which thus becomes to the guest a point of especial and ever-varying interest in the household. The curious construction of these *kuras* is explained in detail; their doors are contrived precisely like our safe doors, with a series of bevelled faces closely fitting into corresponding bevels in the thick jambs.



Thatched Roof, near Tokio.

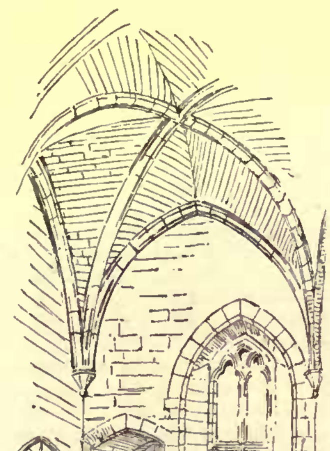
The points of decoration in these simple houses are very few; they are mainly confined to the two recesses before named, to occasional paintings on the partitions, and to open wood screens of curious and delicate device in the window apertures, and occupying occasionally the open spaces over the partitions. When such decorations are attempted, even in the remotest villages, there are always found local artisans, skilled in precious handiwork, capable of producing, in carving, painting, inlays, or open screen-work, effects of great elegance and refinement. (See p. 172.) These rare points of artistic interest in the Japanese household contrast with the plain and serviceable character of the rest of the interiors, in a manner to emphasize the natural instinct of refinement which prevails among all classes. The gentleness of their manners is proved by the fact that they can spend their lives in these frail habitations without a constant destruction of property; and their cleanliness and neatness of habit by their baths, by the disposition and characteristics of their latrines, to which Professor Morse devotes a curious chapter, and by a certain delicate domesticity which seems to prevail over every division of the household, from the guest-chamber to the kitchen. Perhaps the most remarkable feature of these interiors is the absence of ostentatious display in the houses, even of the wealthy merchants and farmers, many of whom are eager collectors of costly curios. The simple and inexpensive methods of construction and decoration, to which we have referred, prevail in all classes of dwellings, excepting occasionally the castles of the daimios, the main distinction among them being difference of size. The rooms are always smaller even than those in our humblest households, but they have the capacity of being readily thrown together by the easy removal of their light partitions. A large establishment seems to be merely a conglomeration of small houses, each with its own roof, generally of one story, with one member of the composite mass in two stories, overtopping the rest, the whole combining in a group often accidentally picturesque, but never apparently with any intention of exterior design. In the best houses there is an abundance of precious pottery and bronzes, of exquisite silks, painted fabrics and screens, fine ivories and antiques, but they are stored in iron-bound chests and elegant cases, and set away in their fire-proof *kuras*, to be brought out, one by one, to decorate their *tokonomas* from day to day, or to be reviewed for the entertainment of a sympathetic guest. This truly is a characteristic of high civilization and natural, unaffected refinement, which is not found in the households of Europe or America.

We may observe these same qualities also, together with a fondness for minute and dainty detail and a curious respect for traditional customs, in the laying-out, planting and maintenance of their little gardens, in which not only wonders of patient horticulture, but imitations of picturesque natural effects are produced, quite beyond the reach of our coarser touch.

Professor Morse's book is, in short, well worthy of study by every architect and decorator, because of its fresh ideas in design of detail and construction, and because of its graphic presentation of an artistic spirit manifested in the work and manners of a whole nation. It may be read with profit also by the general student, because it is a revelation of a new phase of human life and character. To all readers its facts are made available by a copious index and an interesting glossary of terms. H. V. B.

THE PONT NEUF.

THE Boston *Herald* has compiled so many interesting facts concerning the history of the Pont Neuf, which failed a week or so ago under pressure of a flood in the Seine, that we give it below: —



Furness Abbey: Engl.d Gateway:

The bridge connected the Ile de la Cité, on which stands the famous cathedral of Notre Dame, with both banks of the river. So noted is this famous bridge, so many stirring events it has seen, that it has been said of it: "To write the history of the Pont Neuf is to write that of all Paris from the time of Henry IV," that gallant monarch whose white plume floated on to victory at Navarre. The old wooden bridges which once were thrown over the river were broken down for the purpose of opposing the Gauls under Labienus, but when the city came into the hands of the Romans the bridges were rebuilt. These were probably two in number. They were left in such a frightful condition up to the time of the Merovingian Kings that Leudaste, the Count of Tours, flying from the vengeance of Frédegonde, the wife of Chilperic, caught his foot between the planks, and falling and breaking his leg he was killed by blows of a heavy iron bar on his throat. The necessity for building a substantial bridge over the

Seine was recognized as far back as the time of Henry II, and it is said that so great were the dangers of going from the Louvre to the Faubourg Sainte Germaine that people preferred a boat to going round by the Cité. It is related of Benvenuto Cellini, that one night he was detained at the palace to a later hour than usual, where he had received a thousand crowns in gold from which to manufacture a salt-seller. His dwelling-place was in the Petit Nesle, and to reach it he was obliged to go round by the Vallée de Misère, the Pont au Change and the Quai des Augustins, inasmuch as the boatmen had gone home. When he reached the Quai des Augustins he was suddenly sprung upon by four robbers with drawn swords. Cellini was a ruffler of the first water, and an accomplished expert with sword and dagger, as his many exploits with both of these weapons testified. So drawing, he made a successful resistance until his people could come to his rescue. It was to prevent the recurrence of such adventures that the construction of the Pont Neuf was determined upon, and the work was entered upon during the last year of the reign of Henry III, in 1478, and a month after the first piles had been driven in, the King accompanied by his Queen, Louise de Vaudemont, and the Queen mother, Catherine de Medicis, proceeded to the works in his state barge for the purpose of laying the first stone.

Henry III never lived to see the bridge completed, although with his court, he passed over it on a temporary planking, in order to reach the Convent des Augustins; but soon after this the soldiers of the League raised its barricades, and the King was obliged to seek shelter elsewhere. During the suspension of the works a colony of Irish, who claimed an asylum on pretence of expatriation from religious persecution, established themselves within the vacated buildings of the unfinished structure, and under the pretence of revenging themselves and their cause upon the Huguenots, caught those who passed over the dangerous causeway by the foot, and dragging them down murdered and stripped them, and then threw their bodies into the river. It is said that they were not, indeed, in the least overnice as to what sect their victims belonged to, the bare suspicion of their being Huguenots being quite enough. For four long years this colony were permitted to practice their outrages, when the people, taking the matter in hand, caused the Irish to embark in boats, and sent them down the river "to prey at fortune."

Ten years later, in 1598, Henry IV set to work upon the completion of the bridge, and he opened it with all conceivable ceremony on Friday, the 20th of June of that year. He was warned not to cross it, having been told that it was dangerous, and that many were killed in attempting its passage. To this he made ready answer, "But not one of them was a king." Shortly after the opening of the bridge, the buildings for the goldsmiths were begun, and scarcely had the bridge been opened than it became the centre of Parisian life. Edouard Fournier, who wrote a history of the bridge, says: "If from the seventeenth century the heart of Paris beat anywhere, it was most assuredly at the Pont Neuf; there was its centre, there its life; it was to this point so favorably situated at the meeting of the three great quarters—the town, the city, and the university, as they were at that time called—that all activity directed itself; that the hurried and agitated crowd ever bent its steps, and that all rumors and reports of the noisy and ever turbulent multitude were concentrated." The bridge became in its early days particularly a haunt for thieves, and in the time of Henry the Fourth they were so audacious that they were spoken of as wolves springing with a bound upon the Pont Neuf. They were a regularly organized band, and held their court on the river below in boats, from whence they committed the condemned to the waters after their execution. Henry himself was once seized by the mantle when crossing the bridge, by a madman armed with a naked dagger, and but for the promptitude of his attendants he would have lost his life. At both extremities of the bridge judicial executions, such as hanging and decapitation were performed, and in 1617 the Maréchal d'Ancre had scaffolds erected for those who arose in insurrection against him, on the very bridge itself. Not long after he was murdered on the drawbridge of the Louvre, and after awhile his body was disinterred from its burial place, gibbeted upon one of his own scaffolds, and then torn to pieces by the maddened mob. Previous to this the equestrian statue of Henry IV had been erected, which was inaugurated on the 23d of August, 1614. Concerning this famous statue innumerable stories have been told, but the real facts concerning it were not known until its destruction, which took place on the 12th of August, 1792, when a record was found under one of the feet of the horse.

The statue was founded by John of Bologna and his successor, Peter Tacea, at Florence, in Italy, and it was shipped for Paris at Leghorn. Off the coast of Sardinia it was wrecked, but it was subsequently recovered by the Genoese, by them reshipped, and finally taken up the Seine in a flat-boat. A month before its arrival Louis XIII had laid the first stone of the pedestal destined as its resting place, and the pedestal with its four slaves, bas-reliefs and inscriptions, was completed by that magnificent prelate and astute statesman, the Cardinal Duc de Richelieu. But although Henry IV was the idol of the people, this did not prevent the statue being profaned by the public—so much so, indeed, that in 1662 it was deemed necessary to rail it in. The time was, however, when the first agitations of the Fronde occurred, that the people compelled all who passed the statue in carriages to descend and kneel before the statue of the dead hero. And even Philip Egalité, the Duke of Orleans, did not escape this in 1789. Indeed, the Fronde might be said to have been inaugurated and armed on the Pont Neuf; and its most animated and striking scenes were enacted there. The arrest of M. Broussel, counsellor of Parliament, was the first signal of disorders which culminated on the Pont Neuf. The people and the Swiss guards came to blows, and the first barricades were raised. Among those who were maltreated on that occasion were the Chancellor Segnior and the Grand Maître de l'Hôpital. The party of order was headed by M. de la Meilleraie, but with no effect. Some were killed on the bridge, among others being Sanson, the geographer. "The population of the noble bridge," says M. Fournier, "remained true to itself. Up to that time people had been robbed there and assassinated as a matter of necessity; now they robbed and killed there as a privilege of civil war. There was progress in this." Some of the "Frondeurs" were, however, made examples of and gibbeted at the ends of the bridge. In order to distinguish the parties, it was arranged, that those who were opposed to Mazarin (who, by the way, would have received a warm welcome of a rather dubious nature if ever he had been caught upon the bridge) should wear a bit of straw in their hats, or in their head-dress, and the result was that every thief and robber carried on his trade with impunity, and made of the emblem a patent right under which to commit plunder and other depredations.

When the Fronde died out, in the time of Louis XIV, the bridge still remained the scene of robbery by day, and of murder by night, by the banditti who invested it. Jean le Brutal—fit name for a cowardly assassin—was perhaps the most renowned. Manon, the poet, an intimate friend of Molière, was found killed on the bridge. The Baron de Linet was attacked, and after wounding two of his adversaries was slain. At this time, which was about the year 1663, there were said to be no less than 10,000 professional bravos in Paris, who plied their nefarious trade principally on the Pont Neuf. They made no hesitancy of attacking people in the open day. A notable instance was that of the engraver, Papillon, who defended himself so vigorously as to have been able to obtain a refuge in St. Séverin. The bridge was also infested by "*racoleurs*," who are defined as "blackguards who combined the trade of bullies and that of dealers in human flesh for the King's benefit" — in other words, by kidnapping, they recruited the king's armies whenever it was necessary so to do. The houses in which their captives were confined were called "fours," or ovens. Of these there were said to be twenty-eight, and they not only obtained the unwilling recruits for the army, but women and children whose destiny it was to be sold into involuntary servitude in America.

Coming down to 1770, the robbers showed so much audacity that they attacked on the bridge the mail coach coming from Tours, and cleaned it out without molestation. Tradition had it that, if a man stabbed another in his house, he made his servant-maid, if he had not a serving-man, carry the body of the slaughtered to the bridge, and as Jack Falstaff says, "Slaughter him into the river with as little remorse as they would have drowned a blind bitch's puppies, 15 i' the litter," and then they would send the maid after it, on the principle that dead women as well as dead men, tell no tales. In 1720, the bridge was taken possession of by that prince of scoundrels, the renowned Cartouch, and he, with his band, exercised such a sway over it that it became almost as impossible to pass it as it was to pass the Port-au-Charge by night at an earlier epoch. Cartouche and his "gentlemanly assistants," like Lambro, probably the mildest-mannered man that ever cut a throat, had it all their own way by day and by night. But Cartouche came to his end at last, and a by no means pleasant ending it was, for he was broken on the wheel.

In 1742, another band of miscreants, known by the name of "Assommoirs" (we had a play of that name in Boston not long since), became the patrons of the bridge. This was their mode of proceeding: "They finished off at night with desperate and revolting murders the scenes enacted by bullies in their duels, soldiers in their fights, lackeys in their combats, the whole of the long day. It seemed as if the air of the bridge inspired a sanguinary ardor." One of the rufflers of the day, one Cyrano de Bergerac, could not find it convenient to cross the bridge without poniarding the monkey of one Brioche, one of the few exhibitors on the bridge, of which at one time there were numbers. The wits quickly picked up the circumstance, and there is still extant, in very choice French, a piece entitled, "*Combat de Cyrano de Bergerac avec le singe de Brioche au bout du Pont Neuf.*"

The most noted quacks plied their traffic on the bridge, some of them with the utmost success. On it, one of the fraternity, Tabarin by name, made a fortune, bought an estate, but was killed by the neighboring gentry, who would not tolerate such a character among their high mightiness. Lyonnais, who commenced on the bridge as a clipper of dogs, rose high enough in the social scale as to become the master of the royal hounds—a fat, and by no means dishonorable office in that, as in the present day. Lyonnais also purchased an estate, and as royalty was in a degree reflected in him, he was graciously permitted to enjoy it, free from molestation or persecution. On each end of the bridge were cafés. The Café Parnasse at this, and the Café Conti at the other, and up to the time of the Revolution these were the resorts of the wits and the literary men of the day. "Le petit Dunkerque," too, which was founded by a native of that place, enjoyed a widespread reputation for the sale of goods from perfidious Albion. Every kind of itinerant traffic was carried on upon the bridge, and all wants could be supplied. The sellers of bouquets had a well-deserved reputation for the fragrance of their flowers, and the taste with which their nosegays were made up. One

of their number, Mme. Billatee, attained to the high, and to the to-be-envied dignity of "*bouquetière du roi.*" Jeanne Vanberrier, who rose much higher, and afterwards became Countess du Barry, was once well known to those who had business on the Pont Neuf, for she had, in her time, carried about small objects for sale on the bridge.

During the reign of Louis XV, the Pont Neuf was thoroughly repaired. Its parapets were reconstructed, and in their recesses pavilions were built, the seats were lowered, and other improvements made. It was at the time projected to fill up the smaller arm of the river and to make a "continent" of the island known as the city. Small traders got possession of the pavilions on the bridge, and, having once got a foothold, there was no getting rid of them, and so they were protected by two guard-houses, one on the terreplain, and another at the head of the Quai des Orfèvres. Some of them were used as cheap restaurants, where fried fish and pancakes were procurable. In the time of Louis XVI, the bridge had in no whit changed in appearance, and as much trafficking was carried on as ever, with a diminution of robbery and murder. The Parisians long had the fame of being chronic disbelievers, and Mercier relates that in 1774 an Englishman, who was thoroughly aware of this peculiarity, laid a wager, that he would not sell a bag of crowns worth 1200 francs, at 24 sous each, in two hours. He only sold three, and these to an old woman, who, after carefully examining the coin, gave him six 24 sous pieces in exchange for three crowns of six livres each, with the exclamation, "*Ma foi! je me risque!*"

It was on the Pont Neuf that the great French Revolution had its beginning, and after the capture of the Bastile, four guns were placed on the terreplain, always loaded, and always ready to call the people together by their boom, which could have been heard over all Paris. It was from the Place Dauphin and the Pont Neuf that the mob started on its way to Versailles, on the 5th of October, to make prisoners of "Le Boulanger and La Boulangère." The flight of the royal family to Varennes on the 21st of June, 1791, was announced to the populace by the cannon of the Pont Neuf. On the 26th of July of the following year amphitheatres were raised on the bridge to enroll volunteers for the patriot army. The Marsellaise was first heard in Paris on the Pont Neuf when the auxiliaries of the Reign of Terror halted there on their arrival on the 30th of July, 1792. The 10th of August was announced from the bridge as early as 1.15 in the morning by its guns, and the next day all the statues, excepting that of Henry IV, were overthrown, and this obtained a respite of twenty-four hours only. The guns on the terreplain did not announce the execution of the unfortunate Louis XVI, and the beautiful and still more unfortunate Marie Antoinette; but they did proclaim the massacres of September, and on the 31st of May, 1793, the fall of the Girondins and the triumph of the Mountain. The body of Marat, in a state of semi-nudity, was paraded over the Pont Neuf, showing his gaping and still bleeding wound, after his assassination by Charlotte Corday. Over the bridge rumbled the tumbrils which conveyed the victims of the Conciergerie to the scaffold on the Place de la Revolution. It was on the Pont Neuf that Napoleon Bonaparte first tried his hand against the Revolution on the thirteenth Vendémiaire, and from that day the Revolution saw the beginning of its end. After the restoration of the Bourbons, the statue of Henry IV was once more set up,

> "And there it stands until this day
> To witness if I lie."

During the Revolutions in July, 1830, and in June, 1848, the Pont Neuf was the scene of no fatal encounters. It has resounded to the tread of two conquering and invading armies—the allies after Waterloo, and the Prussians after Sedan. The old bridge, with all its historical associations, is a thing of the past. They may set it up anew, but all that was historical and traditionary with it sunk with its stones into the river bed. They cannot bring back the past.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE NEW HIGH-SERVICE PUMPING-STATION OF THE CLEVELAND WATER-WORKS, CLEVELAND, O. MR. F. C. BATE, ARCHITECT, CLEVELAND, O.

THE station consists of boiler-house, engine-house and stand-pipe tower. All the foundations are started on a bed of shale rock, and extend eleven feet below the surface. The Amherst stone was used in the construction, with stock-brick tower and chimney. The tower at its highest point is 240 feet, and contains iron spiral stairs to the balcony at top; the inside of tower above cornice is carried from square to round by means of cast-iron angle brackets bolted together so as to entirely gird the tower at that point. The engine-house contains a pair of Cornish engines, the first ones used by the city, and removed to their present position from the old pumping-station near the lake shore; they originally cost $90,000, and were constructed in 1855; they are still as good as new. The cost of the building is $100,000.

HOUSE OF H. M. DUPEE, ESQ., CHICAGO, ILL. MESSRS. ANDREWS & JAQUES, ARCHITECTS, BOSTON, MASS.

THE J. F. SLATER MEMORIAL FOR NORWICH FREE ACADEMY, NORWICH, CONN. MR. S. C. EARLE, ARCHITECT, WORCESTER, MASS.

CHURCH OF ST. GEORGE, NEWBERGH, N. Y. MR. F. C. WITHERS, ARCHITECT, NEW YORK, N. Y.

TALL CHIMNEY CONSTRUCTION.[1]—VIII.

SHOULD A LIGHTNING-CONDUCTOR BE INSULATED?



MR. R. S. NEWALL, F.R.S., in writing of the best system of fixing lightning-conductors says, "many thousands of conductors have been supplied and fixed under my direction, and I always condemn the use of insulators in attaching conductors to buildings or ships' masts; they add greatly to the expense, and are useless. Buildings are bad conductors of electricity, and offer great resistance to its passage; we therefore require to make them better by fixing to them a metal, and as copper conducts about six times as easily as iron, it is generally selected. A copper conductor of equal efficiency to an iron one is cheaper for equal lengths, and it does not rust so easily. It does not matter in what form it is, whether a wire rope or a rod, so long as it is of sufficient weight per foot. The rope is preferred because it is more easily made continuous, and is more easily handled and erected.

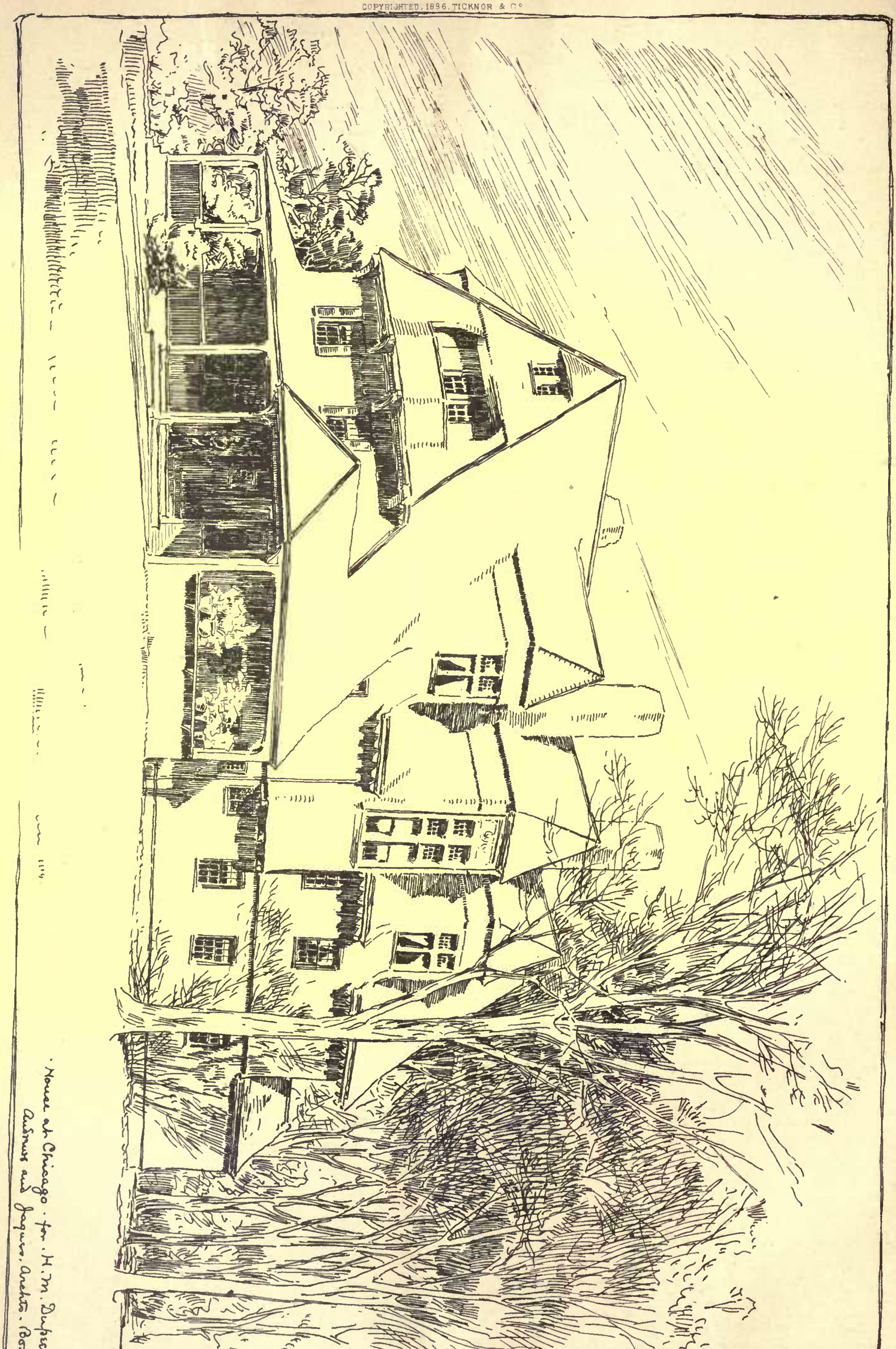
"The upper terminal of the conductor may be a point projecting a very short way above the building, or it may be a good metallic contact with the bottom of the wind vane or a statue of metal. In the latter case there is no need to have a horn projecting from the head, as is the case with the Duke of York's monument in Waterloo Place, for the head itself forms an excellent terminal. The next point is to secure a good earth contact. This may be done by burying about ten feet of the conductor in the soil, which should be as damp or wet as can be found; or it may be wrapped round a cast-iron water or gas pipe in the ground. Do not attach it to any small tin or lead pipe, as such pipes are not of sufficient capacity to allow the electricity to pass, and they might be fused by a heavy flash. I have never heard of a case of a conductor being melted where it was of sufficient capacity and properly fixed. The conductor does not attract electricity any more than an umbrella attracts rain. A conductor may be constantly at work transmitting electricity without any explosion, but if a flash does occur, it will always select the best and shortest road, and certainly will not leave a good road for a bad one. I would therefore advise all to see that their conductors are of sufficient size; and here I may state that a half-inch rod of copper has never been known to be fused by lightning. It weighs three-quarters of a pound per foot and that ought to be the weight of the conductor. See that it is continuous from the highest point or points to the earth, and fixed to the building by holdfasts, without insulators, which only help to swell the bill of costs. A house well protected by conductors need not be insured against damage by lightning — it insures itself."

R. J. Mann, vice-president Meteorological Society, says:—"There is no doubt whatever *that insulators are not required* by lightning-rods. When the earth-connection of the lightning-rod is of ample dimensions and complete, it is not of any practical moment whether the rod itself is attached to the building by metallic clamps or by earthenware supports. Even with an imperfect earth contact, the insulators ordinarily employed are of no use, because a high-tension lightning discharge makes its way through such a puny obstacle as an inch or so of glass or earthenware with the utmost facility. A moment's reflection will make this apparent since it is no uncommon thing to hear of a lightning discharge leaping disruptively through a stone wall two yards in thickness as if it were merely a sheet of pasteboard interposed in its path. What is really required is that the discharge should be deprived of its high tension, and be converted, as far as may be, into a gentle and continuous stream, which has no tendency to burst away from the conducting path. This is what is accomplished when a proper earth contact is provided for the rod; a spacious outlet for the escaping electric stream is in that way open at the base. The most convenient and ready expedient by which this may be done is by packing about three bushels of coke closely around the lower termination of the rod, laid along in a trench cut into the ground to an extent of about twenty feet."

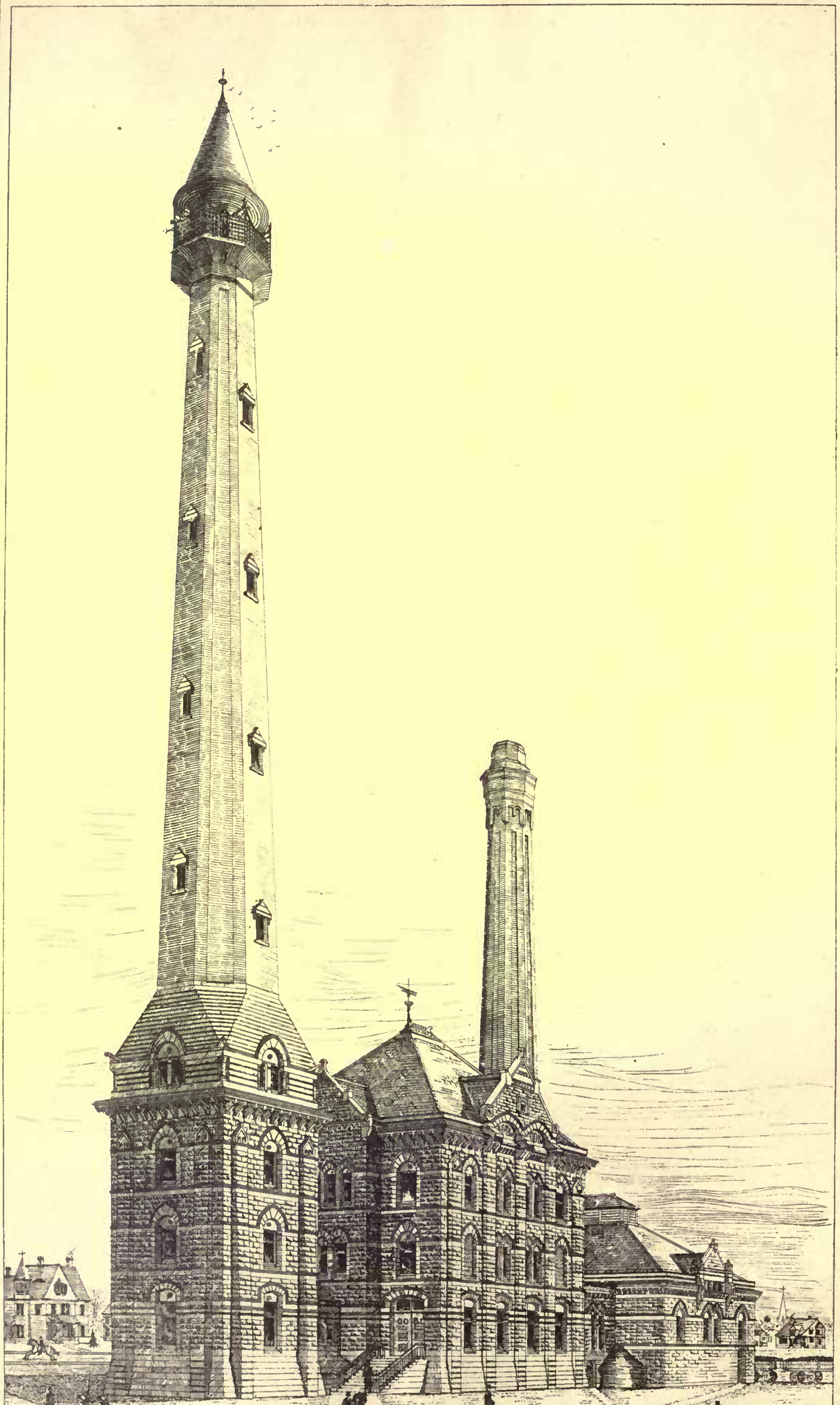
A copper band is assuredly a better lightning-conductor than a

[1] A paper by R. M. Bancroft and F. J. Bancroft, read before the Civil and Mechanical Engineers' Society. Continued from page 270, No. 519.

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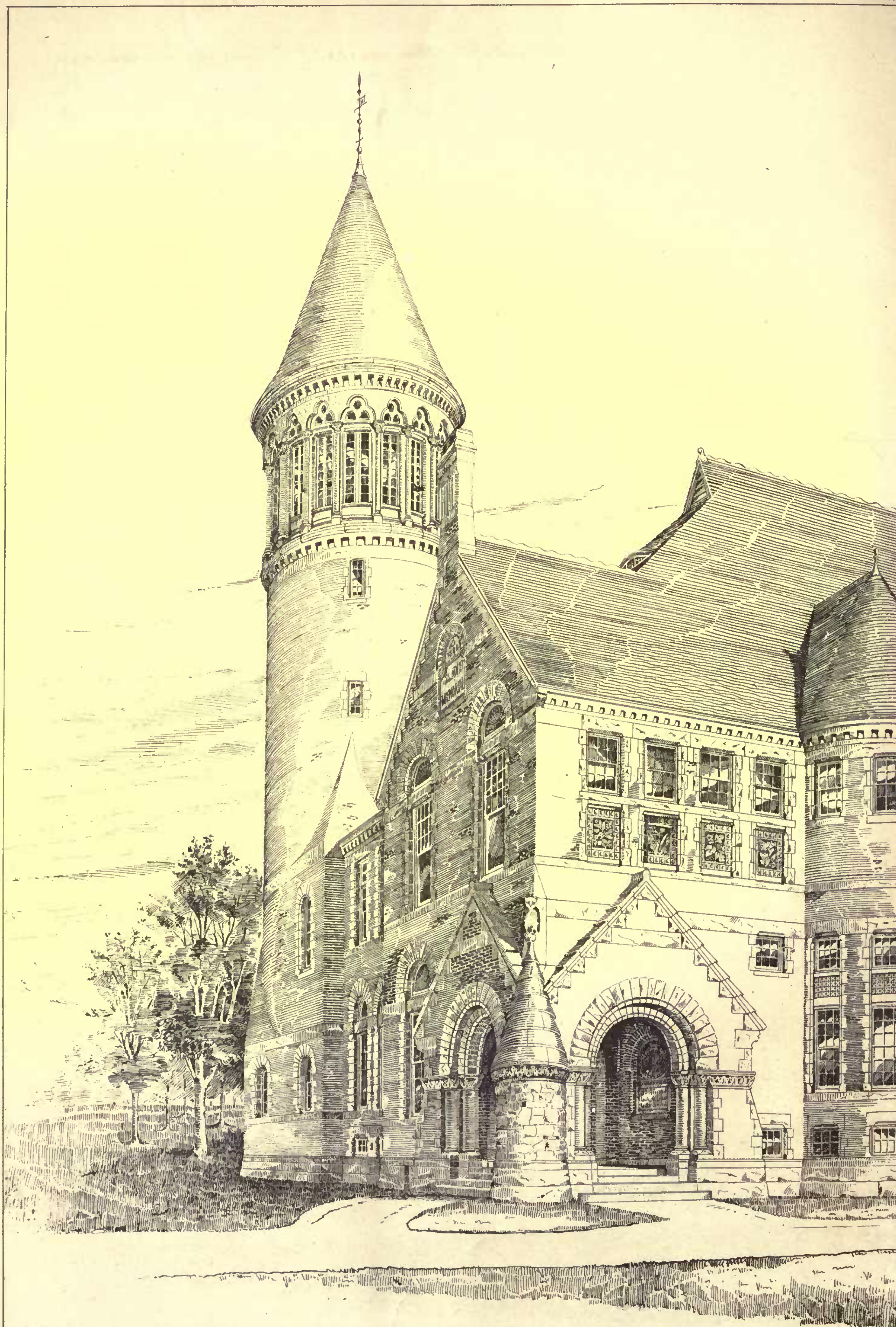
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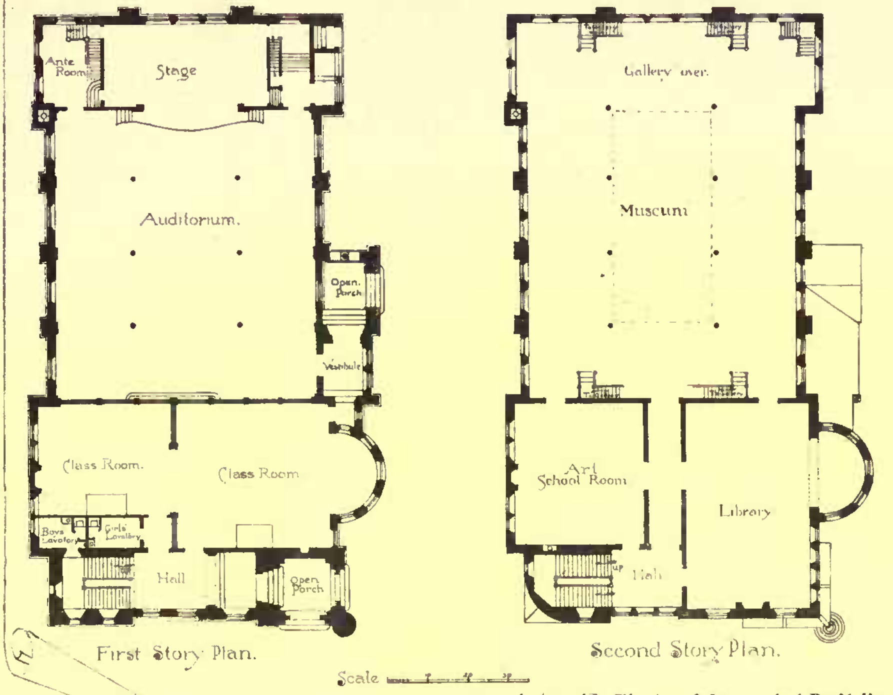


-CLEVELAND WATER WORKS * NEW HIGH SERVICE PUMPING STATION * HEIGHT OF TOWER 250 FT.
-F. C. BATE, ARCHITECT-

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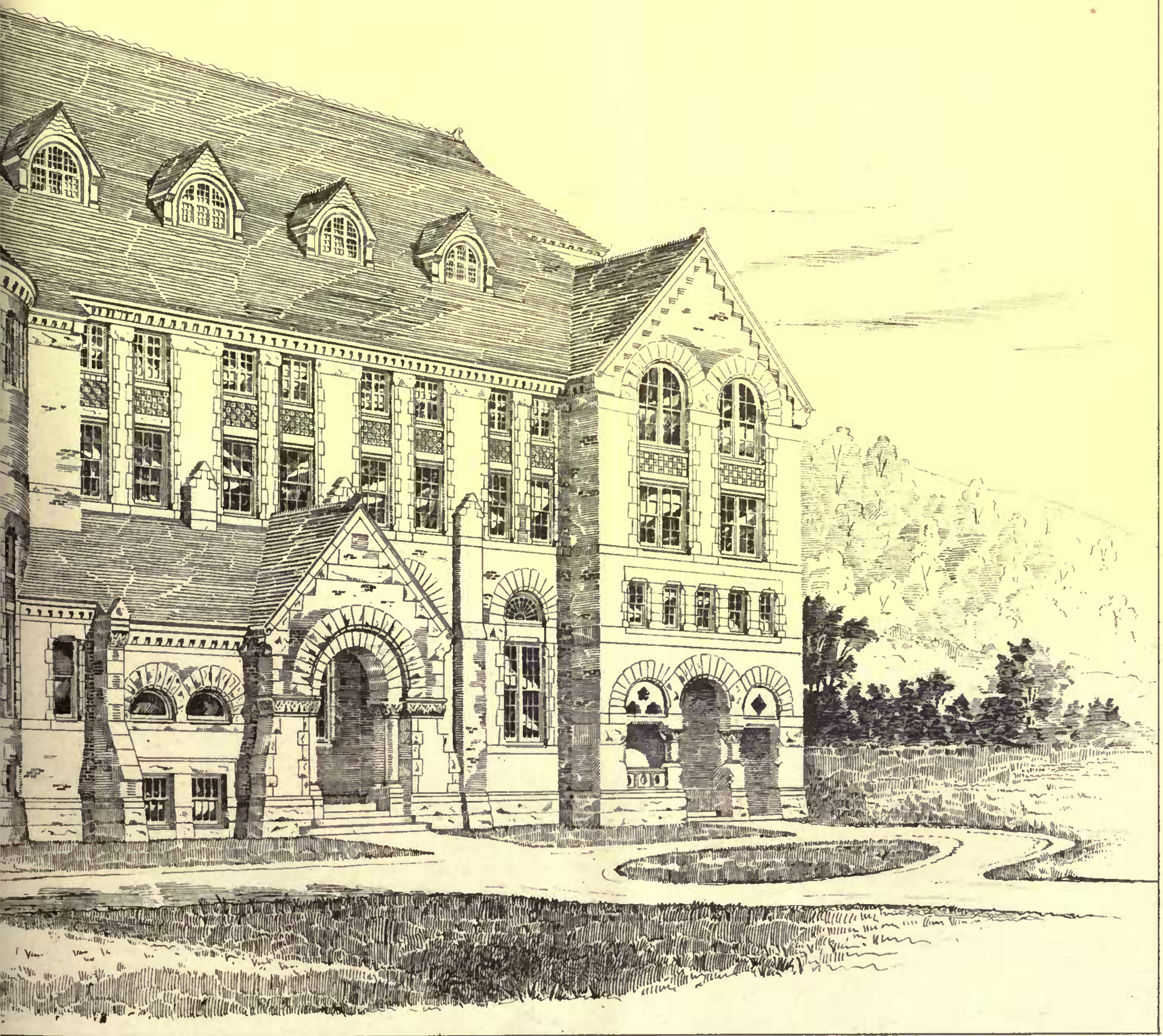
COPYRIGH





Stephen C. Earle, Architect. Worcester Mass.

John F. Slater Memorial Building. for the Norwich Free Academy. Norwich Conn.



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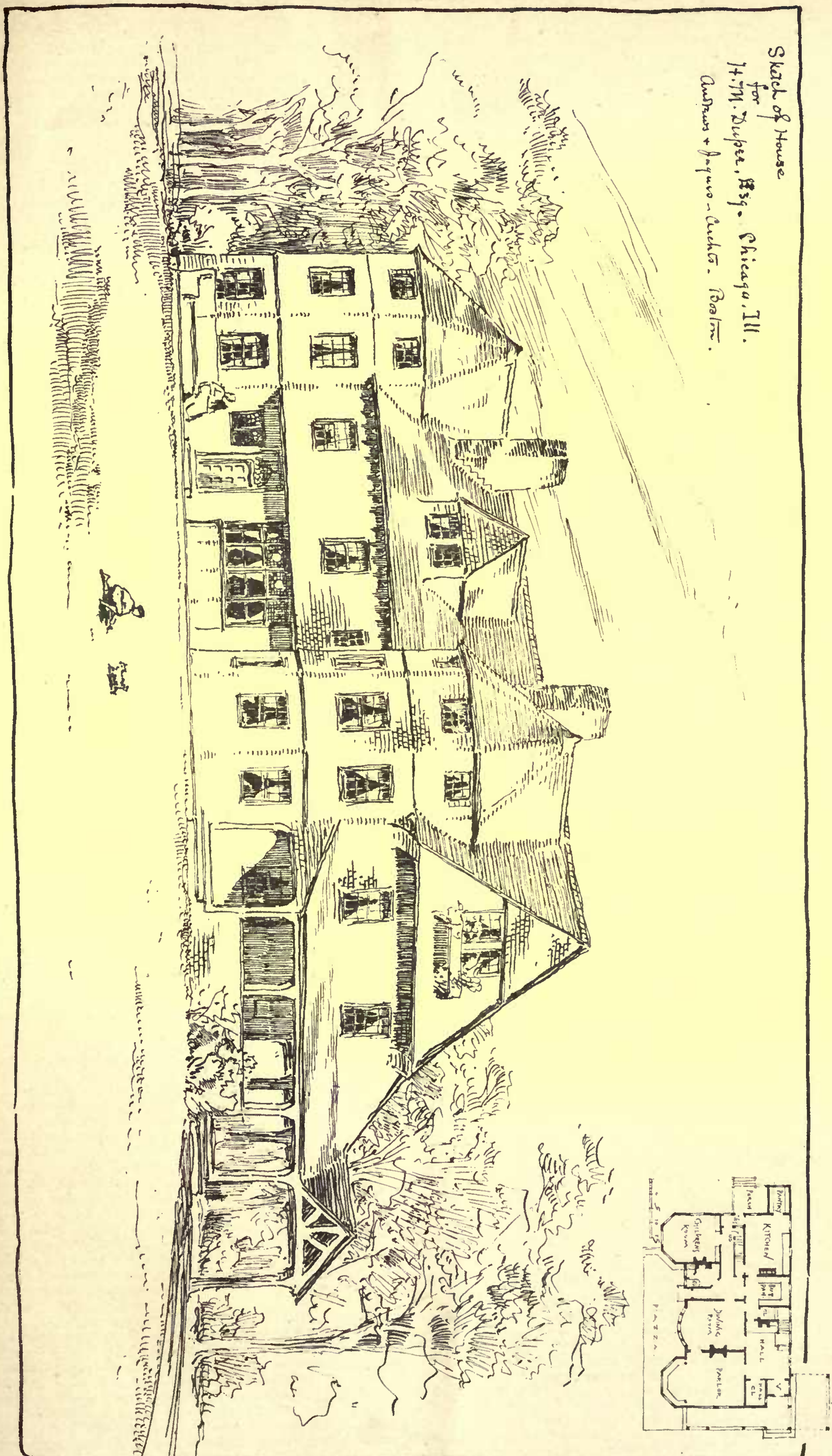
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St. George's Ch: Newburgh. N.Y.: Design for Tower &: Mr. Frederick. C. Withers. Arch. N.Y. 1885

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twisted rope of copper wire of corresponding dimensions, because the rope is liable to be molecularly strained in the process of manufacture, while the copper strap or band is actually improved for its work of electric conductor by the process of rolling which it has passed through. The size of the conductor is matter of more importance than is generally conceived, for two distinct reasons, which both require to be taken into account. In the first place, a half-inch rod of copper is certainly not a "sufficient protection in all circumstances." The resistance, and therefore the comparative inefficiency of a lightning-rod, increases with its length as well as with its smallness. A rod which is employed to protect a building one hundred and sixty feet high requires to be as large again as one that is used for a building eighty feet high, and twice as large again for a building twenty feet high. A considerable proportion of the accidents from lightning in towns occur to very large chimney-stacks, most probably from this very cause. When the conducting rod of a tall chimney shaft is of insufficient dimensions for its conducting work, there is always a ready temptation for the discharge to leap across the brickwork to the heated air and soot-covered surface within the shaft, which too often have a better communication with the earth than the outer rod. If my memory does not deceive me, there was one notable instance in the experience of Mr. Gray, the associate and successor of Sir William Snow Harris, in which a copper-wire rope three-quarters of an inch in diameter proved insufficient for the protection of the lofty tower of St. Mary's Church, Taunton.

The copper tube which was so efficiently used by Sir William Snow Harris in his system of protecting ships was virtually a copper strip, or band, turned round upon itself into the form of the tube. The flat band has an advantage over the tube for land use, chiefly on account of its flexibility and ready adaptability to irregular surfaces, which it shares with rope; of the readiness with which it can be rolled to any required length, and can be made of any desired thickness and breadth; and of the facility with which it can be coiled for transport. The passage from the form of the tube to that of the tape or band, was a natural transition. I believe that strap form of conductor has been employed by Mr. Gray, the successor of Sir W. Snow Harris, for a considerable time. It certainly, on the whole, constitutes the best kind of lightning-rod that can be adopted; and great service has been rendered by the manufacturers who have recently improved and simplified the process of manufacturing the copper tape in this flexible and convenient shape.

There is, however, another point of view in which the size of the lightning-rod had to be contemplated, and this needs to be very carefully noticed, because it is so habitually overlooked in most references to the question. A lightning-rod may be quite large enough not to be destroyed by an electrical discharge, and yet be so small that it very materially impedes the free flow of the electric force passing through it. The resistance offered by a conducting rod to the passage of a discharge of lightning is in proportion to the smallness of the rod. The smaller the rod the more leapingly, and, so to speak, "disruptively," the discharge must make its way through the conducting mass. The smallness of the rod, therefore, favors the high-tension tendency of the discharge, or, in other words, gives it increased inclination to find a devious path by lateral and erratic outbursts, instead of following the course intentionally provided for it. For this reason it is well that the capacity of the rod should be made as large above the mere standard size that is conceived to be sufficient to withstand the fusing power of lightning as circumstances allow. A lightning-rod that would only just escape fusion and destruction from a discharge would certainly be a very insufficient protection against accident. The imperfect apprehension of this principle, again, is one which in all probability is not an infrequent cause of mischief.

I am somewhat anxious here to say I think the old dogma that "a conductor does not attract electricity any more than an umbrella attracts rain," cannot now be received in an absolute and unqualified sense. A conductor in the near presence of a charged thunder-cloud becomes inductively excited, a very strong charge of the opposite kind of electricity to that in the cloud being drawn to the top of the rod. When this state of things has been brought about there certainly is a stronger tendency for a spark or flash to pass across the intervening air-gap than there would be in the absence of any such inductive disturbance. The electricians who still hold this view would probably, nevertheless, hesitate to carry their argument home to its ultimate conclusion by saying that there is no attraction between the outer and inner coating of a charged Leyden jar immediately before the electric forces shatter the glass to effect the discharge of the jar. It is, indeed, almost universally held that the charge of a Leyden jar is chiefly due to the attraction of the severed electric forces exerting themselves to unite through the insulating barrier of the glass. The charge in the outer coating of the jar comes up from the earth under what in familiar terms can hardly be called anything else but "the attraction" of the inner jar.

These several points which I have alluded to are all very important ones in their practical bearing, and in reality require that more should be said concerning them than could possibly be attempted in this place. The Meteorological Society, however, has a standing Lightning-Rod Committee, which has been especially formed to deal with such questions, and to give the best information available in all that relates to the construction of lightning-conductors to any one who may refer to them. They also particularly desire to have exact accounts of accidents from lightning furnished to them, as affording most valuable suggestions and assistance in some of the investigations in which they are engaged.

LIGHTNING AND LIGHTNING-CONDUCTORS.

Lightning is atmospheric electricity moving through bad conducing matter in an explosive form.

A lightning-rod is a conductor of electricity so applied to an object as to prevent the accumulation of free electricity upon it, by induction, and also to enable it to transmit in safety, the electric force by which it may be assailed.

The vapory masses of electrified clouds opposed to the surface of land or sea oppositely electrified, by induction, with the non-conducting medium, air, intervening, constitute a battery of enormous power.

If a discharge takes place, from any cause whatever, at any point, the cloud is left in a neutral condition, induction instantly ceases, and all the bodies charged by induction instantly return to a neutral state.

The suddenness of this return is what is known as the return stroke, and often kills men and animals, or destroys buildings which are at the time at a great distance from the place where the direct discharge occurs. All the terrible effects of the return stroke may result when the direct discharge has been between two oppositely electrified clouds.

There is one law of electrical action which some electricians lose sight of entirely in considering this subject, viz.: That large quantities of electricity pressing upon small surfaces become quite unruly, and when the surface is reduced to a mere point, the tension becomes so great as to give rise to an escaping current. If, instead of terminating the rod in a ball, we use a finely-plated point attached to the building, we will at once have a flow of free electricity from the building into the air by means of the rod and point; and as the particles of air become charged they will be repelled by the electricity being conducted from the earth by the rod, and attracted by that contained in the cloud. Thus it will be seen that a pointed conductor, placed directly in contact with the building, tends to prevent the accumulation of electricity upon it, and also to neutralize the charged cloud; hence it may prevent a disruptive discharge which might otherwise occur. If the rod be removed from the building by insulation, it is powerless to prevent the accumulation of electricity on the building by induction; hence by insulating a rod we lose its most valuable influence. If a discharge falls upon an insulated rod, and be conducted by it to the earth in safety, and without intermediate explosion, still the conditions requisite for a return stroke are present, and the insulated rod is powerless to prevent injury to the building or its contents at the very instant of the direct stroke.

Phenomena of this character are quite frequent, especially where buildings have gas or water pipes to lead the return stroke into the house, and in consequence many have condemned the use of lightning-conductors without investigating the cause of the disasters.

The closer conductors are applied to the walls of a building the better; indeed, it is absolutely necessary to attach the rod directly to the object to be protected, to insure safety, for in no other way can we guard against the return stroke, which kills more people and destroys more property than the direct stroke.

The conductor must not be placed at a distance from the object to be protected, nor pass over nor through rings of glass or other insulators. Insulators are not only useless, but are positively dangerous before rain falls; after rain falls they acquire some degree of conducting power; at best, they are entirely useless as a means of safety.

It is a physical impossibility for any object to be injured by lightning, if the conditions of safety known to be demanded are fully complied with.

The distribution of free electricity over the surface of electrified bodies depends upon their form and the position which they occupy with respect to surrounding bodies.

It is conceded that the greater the curvature of a surface at any part, that is, the nearer it approaches a point, the greater will be the accumulation of electricity there; that electricity tends to flow towards, or to accumulate at, the pointed portion of bodies; that metallic bodies of a pointed shape soon loose the electricity imparted to them, and that it is impossible to charge a conductor when a sharp point projects from it, or of one having conducting communication with the earth is held near it. Points are of value aside from preventing the accumulation of electricity on the object to be protected, and their tendency to lessen the intensity of the cloud. Having become the origin of active mechanical force, namely, by discharge, prevent any other portion of the conducting body from which they project from acquiring the same conditions, and thus preserve their own predominance.

A geometrical point is without dimensions. A practical point has dimensions which are, in comparison to other bodies, quite insignificant. Some electricians, still accepting the one-fluid theory of Franklin as being true, claim that points draw off electricity silently and quietly from charged bodies with which they are not in contact; that a cross section of any lightning-rod would be an infinitely small point in comparison to a cloud, and therefore the points upon lightning-rods are useless except as ornaments.

The cross section of a lightning-rod would be, as claimed, an infinitely small point in comparison to the area of a cloud; but, unfortunately for the advocates of the one-fluid theory, points do not receive electricity from charged bodies from which they are not in contact, except in cases of disruptive charge.

The silent flow is always from points, never towards them. Electricity cannot leave the cloud except by conduction or disruptive

discharge. The upper termination of a lightning-rod must be a mere point in comparison with a cross-section of the rod upon which it is used. The object in terminating the rod in a point is to increase the electrical tension at its upper extremity sufficiently to give rise to an escaping current of electricity from the rod. If the upper portion of a lightning-rod be insulated and separated from the lower section by a slight opening, electric sparks will pass through the space during the passage of electrified clouds so rapidly that neither the eye nor the ear can discover the intermissions. If the point be removed the sparks will cease. This experiment demonstrates the value of points, and proves that lightning-rods do tend, as before stated, to neutralize charged clouds.

The free electricity with which buildings are charged by induction will, in every instance, accumulate with the greatest intensity upon the ridges and gables, sometimes with greater intensity at one gable than at another. It is, therefore, absolutely necessary to place a point at each gable, to discharge the accumulated electricity there held by the opposite force contained in the approaching cloud; to place a point at each chimney or ventilator, to offer a line of superior conduction to that offered by ascending smoke, current of heated air or other gaseous matter; to connect all these points together with rods placed along the ridges, and also to connect them with gas-pipes, water-pipes, steam-pipes, or other metallic substances about the building. The more numerous the connections with the earth the better, not only to provide sufficient lines of conduction, by means of which we may so far neutralize the passing cloud as to prevent a disruptive discharge, but also to give the electrical agency an ample line of conduction, so as to prevent intermediate explosion during its transmission. As we depart from this system of applying rods the protection diminishes. Each ground rod should have several branches penetrating the earth to permanent moisture, and where it is difficult to obtain such a termination, they should be embedded in charcoal.

Trees near dwellings do not, as many suppose, afford protection; on the contrary, they increase the danger to persons or property in their vicinity, and the necessity of using lightning-rods to prevent damage. They offer facilities for a direct discharge, consequently objects near them are in great danger from the return stroke. The fact that trees are injured by lightning is proof that they are poor conductors, while the large number of persons and animals annually killed near them by this same element is conclusive evidence that they do not afford the protection claimed.

In newly-settled countries the cabins are usually provided with stoves, the pipes of which project through the roof; while these pipes do not in the least attract electricity, they furnish a path of less resistance than that of the surrounding air for its passage, the effect of which has often proved fatal to the occupants.

To escape injury from lightning, protect buildings as herein directed, and remain in them during thunder-storms. Keep out of cellars, and avoid being near trees during the passage of electrified clouds. In case the gas or water pipes of a building are not connected with the lightning-rods, it is not safe for a person to remain in a position in which his body would become part of the line of least resistance between them. Beds should be removed from the walls. Persons in chairs should be in the centre of the room, and keep their feet off the floor.

The height a rod extends above a building has no influence whatever upon a discharge of electricity further than arises from the fact of its offering a path of less resistance than the surrounding air before the discharge takes place. It is for this reason, solely, that the rod is carried a short distance above the ridge of a building, and is projected above the tops of chimneys, ventilators, etc. It cannot be supposed for a moment that an agency which moves with such terrible velocity and irresistible force as lightning, could be arrested in its onward course and drawn aside by an insignificant piece of metal in the form of a lightning-rod. If metal does possess this power of arresting lightning, the use of metallic eave-troughs, steam-pipes, gas-pipes, water-pipes, bell-wires, bells, valleys on roofs and buildings, chimney-tops, cornices, etc., in and about buildings should be at once discontinued, as they may attract more electricity than they can carry off. The idea that metal attracts electricity is unsupported by any fact, and is absolutely at variance with the whole course of experience. Such an opinion has arisen entirely from assumption and a partial consideration of facts, or from superstition, prejudice, or unadulterated ignorance. Lightning-rods do not attract lightning.

M. Francisque Michel, secretary of the French Committee for lightning-conductors, in speaking of the copper-tape conductors, says: For myself, personally, I am decidedly opposed to the employment of wire ropes as lightning-conductors, and I have given a paper on this subject before "l'Académie des Sciences (see T. 82, page 1332)," and the following are the principal conclusions arrived at, viz: —

The wire ropes, being made of small wires, are full of interstices, which admit and forward the lodgement of atmospheric gases (smoke included), where by reason of the alternate dry and damp atmosphere, these gases, dusts, etc., endowed with different strong chemical properties, attack the metal, to the great detriment of the conductibility of the system and preservation of the conductor. Furthermore, under the combined influence of the passage of electric currents and of the atmospherical action, the copper wires which compose the rope break up into a multitude of molecules; their molecular structure modifies itself, they become sharp-pointed and fragile as glass under the influence of the vibrations occasioned by the wind, and in a very short time one finds a considerable number of ruptures, which reduce to a very notable proportion the efficacious part of the copper-rope conductor — and more, at this period the communication between the wires no longer exists. I must also mention that with your solid copper-tape conductors this molecular modification does not take place, which I have fully tested and proved by many experiments, and which the copper coverings of the roofs on some very old buildings fully attest, and which we replaced in connection with lightning-conductors.

Then from a practical point of view, the wire-rope conductors do not present the slightest certainty, because during the operation of fixing, when inevitable ruptures are produced in one or other of the wires, most frequently the workmen twist the wires in order to re-attach them, without making sure of the communication by means of soldering, in consequence of which, in a very short time the contact between the two lengths of the wires leaves much to be desired. From this alone I have found copper-rope conductors, although nearly new, present a very trifling conductibility, and completely insufficient. Such are the principal reasons, in my idea, why copper-rope conductors should be abolished.

The reason why they have hitherto been employed is because they possess great flexibility, and can be made in great lengths without splicings. But your solid continuous copper-tape conductors possess the same advantages in those respects; moreover (and I insist on this point particularly), they present a large free surface — a most excellent quality for a lightning-conductor. Then, by their considerable flexibility conductors not only apply themselves to all the architectural details, but even in close contact with the walls and permit when these last are wet by a shower or storm, to increase, in a very notable proportion, the draining surface of the electric charge, of which a part can then pass by the sheet of rain water adhering to the walls, and in good communication with the earth.

THE END.

BOOKS PAPERS

SUCH a book[1] as, given just this name and just this author's name, we were entitled to expect, would have been a most valuable acquisition. The English-speaking tourist needs a thorough, detailed, historical and architectural guide to Paris — a guide which shall explain the present and recall the past, and describe the evolution by which the one has grown from out the other; for, while there is no modern city so interesting as such, there is none which, as a mediæval city, was more interesting, and yet none in which the two phases are more separate and alien. And a guide of this kind we were entitled to expect from Mr. Hamerton, because, although he had never won his spurs as an architectural critic, he had proved himself in other fields so conscientious a student, and so careful and clear an expositor, that we had a right to believe he would not venture into this new field with more superficial intentions or a slenderer equipment. But a great disappointment was in store for us. The book is both slight and superficial, and the author has for once attacked a subject upon which he does not prove himself very well qualified to speak. Only a few of the most important buildings of Paris are mentioned, only a few of the vast list of facts we looked for are given, and not always are they given with clearness, and but seldom with any deeper instructiveness than may be gleaned from the pages of an ordinary traveller's hand-book. The difference is merely that they are set forth much less concisely, are borne upon a flood of personal impressions and æsthetic, or sentimental, or moralizing observations. And I think even those who value most Mr. Hamerton's earlier works (among whom I hasten to count myself with expressions of sincerest gratitude) will hardly dispute the fact that he is not particularly well fitted for the rôle of a "sentimental tourist." In spite of his undeniable cultivation he remains somewhat of a Philistine in soul, though certainly not in conscious beliefs and theories. He can explain facts (when he thoroughly understands them) with admirable clearness; but he has not the sure taste, the native instinct for what is beautiful in art, that gives value to a critic's opinions about facts; and he has not that charm of style which can make a record of impressions delightful reading, even when the impressions themselves are not of a very valuable sort. He is not a born connoisseur, and he is indisputably not a born Ruskin. His way of writing is always hopelessly prosaic, and every now and then is exasperatingly puerile. He slips continually into gentle platitudes, sentimentalizes in humdrum commonplaces, and illustrates with mild little dreary metaphors, that take us back to the "moral primers" of our earliest childhood. Of course we do not mind, or are quite willing to overlook, all his defects of manner, when as much definite instruction is conveyed as is conveyed, for example, in his books on "*Etching*" and on "*The Graphic Arts*." But here there is so wide a margin of commentary and so slender a thread of information that we cannot but mind very greatly and can hardly bring ourselves to pardon.

For when we consider the quality as distinct from the quantity of

[1] "*Paris in Old and Present Times*:" With especial reference to changes in its Architecture and Topography. By Philip Gilbert Hamerton. With many Illustrations. Boston: Roberts Brothers. 1885.

the information given, are we much better pleased. He tells us in the preface that, though he has written little about architecture hitherto, it has always been a favorite study with him, and he has neglected no opportunity for "increasing such knowledge of it as a layman may possess." But it seems as if even a layman might gain more knowledge about the details, and especially about the main facts and principles of his theme, than is subsequently displayed. Even a layman ought not to mention the Madeleine as one of the most important "Renaissance" buildings in Paris, and ought not to expatiate upon it as an object-lesson in classic columnar architecture, valuable to those who cannot visit original classic works, without perceiving and explaining the difference that results from the way in which its columns are constructed. Even a layman ought not to say that, at the advent of Francis the First, "the beautiful and picturesque French Gothic was cast aside as barbarous," or to speak as though it were a discovery of his own that Renaissance work is not alike in all epochs; and as though it had been left for him to invent descriptive names for its successive varieties.

And special faults of detail are matched by a slovenliness of treatment which it has, indeed, been a surprise to find in a work from Mr. Hamerton's hand. When describing the Hôtel de Ville, for instance, he speaks of the old building and of the new building, but of the old in so very vague a way that the previously uninformed reader can hardly guess when it was constructed; and he names no architect in connection with either old or new. The most modern side of modern Paris comes in for a large share of comment — always appreciative, if not always very discriminating, and seldom detailed enough to afford much instruction. As examples, first of criticism and then of style, I may quote that he says of Garnier's opera-house that, "whatever may be thought of the back and sides" (the context explains that this cannot be much in the way of admiration), "the principal front may be admired without reserve," and that the interior is much "less original," and the *salle* itself "shows the customary arrangements for the audience;" and that he says of the turrets of the Hôtel de Ville that they hold the same place in the great architectural group that "pretty children hold in a family!"

In short, the book reads like the work not only of a novice in architectural criticism, but of a novice in criticism of any kind, and, indeed, of a novice in writing of any kind. And our disappointment in the fact is so great that we are tempted, perhaps, to undervalue the few crumbs of information it does afford. There is, however, one single, solitary sentence which seems to me worth quoting — a strangely felicitous bit of criticism to find amid so many misconceptions and so many sins of omission and of commission. This is a sentence which explains why modern sculptors cannot successfully imitate Gothic work: "They cannot have that blending of pre-scientific simplicity with deep feeling and shrewd observation, which characterizes Gothic art; they know too much, and when they feel, they do not feel in that manner." If this were a fair sample of the book, it would be well worth reading. But it is not — it is a lonely flower in a desert of unnutritive dullness.

The English edition of the book was issued with a number of large etchings reprinted from the "*Portfolio*," in which the text, too, first appeared. But these are absent from the small American reprint — absent without a word to explain the references that are made to them, as though they were still present — and the wood-cuts and little process-prints, which alone fulfil the promise of the title-page, are quite without artistic value, and have an illustrative value of but the slightest kind. M. G. V. R.

SOCIETIES

ARCHITECTURAL ASSOCIATION OF IOWA.

The third convention of the Architectural Association of Iowa will be held at Des Moines, Iowa, January 13 and 14, 1886.

Order of Proceedings. — First Day.

January 13, Morning Session, 10 A. M. — Call to order; roll-call; address of welcome; President's address; Secretary's report; Treasurer's report; report of Board of Management; election of members.

Afternoon Session, 2.30 P. M. — Report of committees; amendment to Constitution; reading of papers.

Second Day.

January 14, Morning Session, 9 A. M.—Announcements; new business; discussion of topics of interest; reading of papers.

Afternoon Session, 2 P. M. — Announcements; recess, to visit places of professional interest.

Evening Session, 7.30 P. M. — Unfinished business; election of officers; appointment of standing committees; reading of papers; next place of meeting selected; adjournment.

General Information.

All motions before the Convention must be made in writing.

Subjects of papers will be announced at the opening of the Convention.

The Constitution and By-Laws must be signed by all who have heretofore omitted this requirement.

Register will be found at the office of the Board of Management.

Architects sending drawings for exhibition will please direct them in care of the Secretary, W. L. Plack, over 520 Walnut Street, Des Moines, who will unpack, arrange, and return them after the Convention.

W. F. HACKNEY,
W. K. BALL,
W. L. PLACK,
W. A. HAWLEY,
J. S. BLAKE,
Board of Management, Architectural Association of Iowa.
W. L. PLACK, *Secretary.*

THE RHODE ISLAND CHAPTER, A. I. A.

THE following list of subjects, arranged by the entertainment committee has been adopted by the R. I. Chapter of the A. I. A., for consideration at its meetings during the season of 1885–1886; the subjects to be considered in the following order, unless other notice is given by the Secretary: —

1. Woods. Kinds, treatment, use, etc. Subject for sketches: to be announced at meeting.
2. Consideration of different forms of Classic Renaissance architecture in the different countries. Subject for sketches: Renaissance mantelpiece.
3. Foundations. Party-walls and laws in relation thereto. Subject for sketches: small railroad station (plans).
4. Color and Decoration. Subject for sketches: a frieze.
5. Treatment of Grounds, Fencing, Drainage, Grading, etc. Subject for sketches: gateway to fine grounds.
6. Office Practice and the Training of Students. Subject for sketches: doorway to an architect's office.
7. Building Materials. Subject for sketches: a small summer house commanding fine view.

It is proposed that at each meeting some member (previously appointed by the President) is to open the subject for discussion, and supplement his remarks by such drawings, models, photographs or other material as may be collected for the purpose. The entertainment committee will render assistance in securing such material in connection with the persons appointed.

In addition to the regular programme, some time will be devoted at each meeting to the consideration of any matters of interest that may be presented by the members, who are requested to submit at any meeting anything they consider of general interest, such as photographs, models, sketches, new materials or methods having any relation to architecture.

At each meeting all are invited to make sketches of the subject for the evening.

Blocks of drawing-paper will be furnished by the Secretary.

The sketches to be the property of the Chapter, and are to be kept together.

COMMUNICATIONS

CHARCOAL TIN.

WASHINGTON, D. C., December 21, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs.— To secure the best roofing-plates, your correspondent "I. C. Charcoal Tin" should specify prime I. C. terne re-dipped charcoal roofing-plates with perfect surfaces, of uniform size, squared, with no wasters among them. The plates should double-seam easily without showing signs of injury. Full-size samples should be submitted. Perhaps still better would be to specify one of the guaranteed brands, such as "Gilbertson's Old Method," "Camaret," "Phelps's Treble-coated," "Old Process," and others. The prices per box of 112 plates, 14″ x 20,″ vary between $6.50 and $7.00, or about 3 cents to 3¼ cents per square foot. Weight of metal per box, about 111 pounds. Very respectfully, O. VON NERTA.

BENDING CAST-IRON.

LOUISVILLE, KY., December 21, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Referring to an article in your paper of December 12, copied from the *Scientific American*, on "Bending Cast-Iron," I have to say that there is in this city a plate of cast-iron about eight feet long, fourteen inches wide, and from one-quarter to three-eighths of an inch thick, which was cast straight and afterwards bent cold, to a radius not exceeding six feet, confined in that position, where it has remained nearly twenty years. Any good cast-iron, if evenly balanced, will bend to a considerable extent, and it is not an uncommon thing, in making stairways with curved treads, to cast the risers straight and afterwards bend to the curve of tread without heating. Some years since, doubting the strength of a lintel I had made, I loaded it until the deflection was one-and-one-quarter inches. The principal reason why cast-iron is unreliable in transverse strains is, the castings are not evenly balanced, and, therefore, on a strain without weight on them. Yours respectfully, SAMUEL P. SNEAD.

OVERLAYING.

December 28, 1885.

To the Editors of the American Architect: —

Dear Sirs,—In an editorial in the issue of December 26, you mention an illustration in the December *Harper's* as having been done by a process similar to the one employed in making your photo-caustic prints, "with the added benefits of . . . . *skilled overlayings.*" I am interested in mechanical reproductions, but am at a loss as to the precise meaning of the term "overlaying." Will you kindly explain its meaning and how it is accomplished? Architect.

[The processes of printing from electroplates are exceedingly interesting and can best be understood through a visit to a press-room where artistic work is printed. The amateur illustrator imagines that if his work be good the printed result must be equally satisfactory; but it is so only through the aid of another artist, the overlayer. In a general way the process is this: The cut-form is placed on the press and a light impression is pulled and then scanned with intelligent care by the overlayer, who studies to find wherein the plain impression falls short of the intended effect. A sheet of paper is then securely fastened round the cylinder of the press, and an impression printed upon this, and upon the illustrations there appearing the printer proceeds to build up his overlays, his object being to secure the emphasis, brilliancy or softness intended by the artist, by causing certain portions of the paper to be pressed against the face of the electrotype with greater or less force than other portions. Thus, suppose a view having a strong foreground and a misty background, and in the misty sky a storm-cloud is to be printed. The first proof shows every part in dull, even tint — remember there are no tones in printers' ink — and the overlayer accepts that as the lightest tone in the background, and brings out the effects by cutting out and pasting upon the cylinder, with artistic accuracy, the corresponding portions of proofs printed on thin paper. In this way the overlay is built up, being thickest over the point where most emphasis is required. Thus, middle distance and foreground are prepared; but if it were attempted to bring out the storm-cloud in the misty distance in the same way, the result would be a smooch. The desired effect is obtained by applying to the under side of the *electroplate itself* "underlays" of paper; in this way a slight curvature of the plate at this point is produced, which secures the desired local effect with the proper degree of softness.—Eds. American Architect.]

SUIT FOR INCOMPLETE SERVICE.

To the Editors of the American Architect: —

Dear Sirs, — I desire to extend to you my thanks for the kind, courteous and able manner in which you answered my inquiries in regard to my rights, as published in the *Architect* of the 12th inst. You shed more light upon the questions involved than I had succeeded in obtaining from all other sources combined. As I know of no more enlightened source of information to which I can apply, and encouraged by my success in the previous case, I come to you again for advice.

I have several cases on hand involving the question of "Ownership of Plans;" but one case in particular, in which it is very essential that I obtain all the information possible before the middle of next month.

The circumstances, briefly stated, are as follows: I sued a party for the recovery of my fees for making plans for a cottage. The amount sued for was $150. The other party put in a general denial that they owed me anything. They did not attempt to prove that the amount I demanded was excessive; but, in spite of this fact, the jury rendered me a verdict for only $50! As this verdict was entirely contrary to the evidence (and every one who heard the testimony said that I had a clear case), we moved for a new trial, which was refused. The other side also asked for another trial, on the ground that a copy of a letter of mine was introduced as evidence, while we should first have demanded a production of the original. After taking the matter under advisement the court finally refused them also. At this time their lawyer applied for the possession of the plans, and the court actually decided that they had a right to them, but upon the objection of my counsel, and after stating what they knew in regard to the custom (which was very little indeed), the judge said he would take the matter under advisement. I learned from the jurymen afterwards that they had no very clear views of what was exactly right in the premises, and, upon my informing them of what was customary as to charges, what we claimed payment for, etc., they each said that, if they had known as much at the time of the deliberations as they then did, there would have been not the least objection to giving me a verdict for the full amount sued for. But they took the ground that, because the plans were not used by the other party, therefore they were of no value to them, but as I seemed to have been acting in good faith when I made them, they thought I ought to receive *something* for my labor!

Under these circumstances, you can see why I am anxious to prevent their obtaining possession of the plans, if possible, and, if you can advise me as to the best and quickest way of obtaining information in regard to decisions on this point, you will confer a great favor.

We have a very extensive and complete law library here, and I have no doubt but what we can find reports of any cases that you may be able to refer us to bearing upon this point.

Hoping that you will be able to shed some light upon this question, I am, yours truly. M.

[We should say that the most prudent course would be to give up the plans, and, perhaps, try later to get additional payment for them. The courts usually hold that the contract implied in the engagement of an architect includes the delivery of the plans if the client demands them, and it is a general principle that one party to a contract must fulfil the whole of his part of the agreement in order to bind the other to do his. After delivering the plans we see no reason why a claim should not be made for the rest of the proper fee. According to the jurymen, the first award was made with the idea that the client did not use the plans, and that the architect therefore only deserved to be paid for his services, exclusive of the work of preparing them; but the demand for them, with the delivery, would, we think, materially change a jury's estimate of the amount due the architect, and it is difficult to see either how a new trial, or a suit for the balance of the commission, could then be refused, or how a jury could avoid awarding the usual fee. — Eds. American Architect.]

NOTES AND CLIPPINGS

The Persian Bricklayer at Work. — When bricklayers are working on a building the one above sings out in a musical tone: "Brother, in the name of God, toss me a brick." The one below, as he throws the brick, sings in reply: "Oh my brother — or, O son of my uncle — in the name of God, behold a brick." — *Boston Journal.*

A Solidly built Chimney. — The Shaler & Hall Quarry company of Portland tried to blow up an old chimney the other day, but only partially succeeded. A block of ten feet was raised a dozen feet into the air, but it fell back into its original site without the loss of a brick. It is evident that the chimney was thoroughly built, and that honest mortar was used.

The Library of the Sultan. — The Sultan's library should be searched through as the first condition of the next loan made to Turkey — if there ever is another — and permission demanded to hunt for that older and more valuable store of manuscripts believed or known to be stored in the crypt of St. Sophia, and protected by the one useful superstition of the Turk — his reluctance to destroy writing, lest perchance it should contain the name of God. That is the last place left where we shall be likely to make a great literary find, and it should be searched before the great day when the destiny of the Ottomans is completed, and Constantinople once more sinks down, a mass of blood-stained ruins, fired by its possessors before they commence their final retreat to the desert from which in the mysterious providence of God, they were suffered to emerge, in order to destroy the Eastern half of the civilized world. — *London Spectator.*

Equestrian Statue of Washington at Boise City, I. T. — Milwaukee having boasted that she alone among cities west of New York has an equestrian statue of Washington, the champion town of Idaho, Boisé City, modestly directs attention to her own equestrian statue of the Father of His Country. It is by a young German sculptor, name unknown, and stands "between the new Capitol Building and the magnificent public school-house, the latter just finished, at a cost of $54,000." It is true that it is of wood; but it was the labor of love on the part of its maker, who carved it one winter while snowed up in the hills. Godless soldiers, also, from a neighboring camp of the army of the United States, have at times thought it funny to wrench off a leg or so from the horse, but the art-loving citizens have rescued all the pieces and restored their Cypriote to the rightful quantity of limbs. America is a great country. Where else could a city reach the effete luxuries of an equestrian statue, vandalism, and "restorations" in such a handful of years? Talk of art centres! Boisé City is the place for American sculptors to visit, if it is true that in the work of this neglected genius "the pose of both horse and rider is grand and magnificent beyond expression by pen, or pencil, and the minor details are worked out with an artst's keen sense of fidelity to truth, which is but nature in this instance. — *N. Y. Times.*

What Becomes of all the Poison? — Not the least interesting of many curious features connected with the production and consumption of certain poisons is the extraordinary quantities that are in some instances manufactured. What becomes of them? It is comparatively easy to understand what is implied by one thousand Winchester quarts of chloroform, and one thousand or even ten thousand ounces of morphia; but what of a poison like chloral? It has already been stated that chloral is at present being manufactured by the hundred weight. This, however, as a matter of fact, falls far short of the reality, as one German manufacturer recently admitted the production of half a ton weekly in his laboratory alone. There is no recognized outlet for the consumption of this substance saving that of internal administration, and we confess the imagination gets baffled in endeavoring to estimate the hundreds of thousands of pain-stricken, weary mortals who must swallow an indefinite number of half-tons weekly, in doses of twenty or thirty, or at the most forty, grains each. A number of years ago, something little short of a panic was occasioned by attention having been called to the fact that strychnine was being manufactured in enormous quantities, one thousand ounces having been known to be purchased at one time. What became of this extraordinary quantity was the question that not unnaturally seized the public mind. As a medicine, its use is necessarily very limited; while its indiscriminate sale or employment as a destructive agent for vermin — the only other legitimate purpose to which it is known to be applied — is restricted by legislative enactment. In such circumstances, it was reasonable to seek some other explanation for its enormous production, and the public mind somewhat mysteriously fixed upon *beer* as being the medium. For a time, it was currently believed that the bitter principle of the hop was substituted, or, at least, fortified, by the help of strychnine; and although this was ultimately disproved, the mystery of the quantities in which it was being manufactured was only partially solved by the suggestion that it was probably destined for the colonies, to assist in exterminating vermin there.— *Chambers's Journal.*

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

332,363. SASH-BALANCE. — John A. Rogers, Hartsell's, Ala.
332,364. PROCESS OF PRODUCING PHOTOGRAPHS IN PERMANENT PIGMENTS. — William W. Sherman, Milwaukee, Wis.
332,383. LIGHTNING-ROD STANDARD. — James W. Cole and Henry Knudsen, Greencastle, Ind.
332,389. ENCAUSTIC TILE. — Franz J. Frenzel, Jr. New York, N. Y.
332,392. BRUSH FOR LINING BRICK HOUSES.—Wm. C. Green, Livingston, Mont.
332,402. CONDUCTOR-PIPE.—John Leadley, Detroit, Mich.
332,413. SHEET-METAL-ROOFING ANCHOR. — William A. List, Wheeling, W. Va.
332,418. HYDRAULIC ELEVATOR. — Parker F. Morey, Portland, Oreg.
332,428. AUTOMATIC FLUSHING WATER-CLOSET. William B. Parsons, Jr., Elmira, N. Y.
332,429. HOT-AIR FIREPLACE. — Doyel Pearson, Memphis, Tenn.
332,455. KNOB ATTACHMENT.—William B. Smith, San Francisco, Cal.
332,456. MORTISE-LATCH. — William E. Sparks, New Haven, Conn.
332,457. TENEMENT-HOUSE. — Wendelin Sturm, New York, N. Y.
332,472. SASH-FASTENER. — John E. Alexander, Bridgeport, N. J.
332,474. BRICK-MACHINE.—John Baillie, Salem, O.
332,478. VISE.—Henry D. Booth, Elmira, N. Y.
332,481. LATH ATTACHMENT.—Edward J. Bracken, Columbus, O.
332,487. HINGE. — Malcolm Campbell, Amesbury, Mass.
332,489. WATER-TANK. — Francis J. Carney, New York, N. Y.
332,491. DEVICE FOR PREVENTING DRAFTS BENEATH FLOORS.—William W. Clay, Chicago, Ill.
332,495. DOOR OR SHUTTER FASTENER. — Patrick J. Conroy, Philadelphia, Pa.
332,522. WRENCH. — Thomas B. Heiney and Clarence G. Lauck, Bucyrus, O.
332,523. CHIMNEY COWL AND VENTILATOR.—Wm. G. Henis, Philadelphia, Pa.
332,570. ROOFING.— William H. Stewart, Brooklyn, N. Y.
332,574. WINDOW-SCREEN.—Samuel J. Vance, Macomb, Ill.
332,580. METHOD OF PREVENTING SALTPETRE EXUDATIONS FROM FORMING ON THE FACES OF WALLS OF BUILDINGS. — James C. Anderson, Highland Park, Ill.
332,635. VALVE FOR WATER-CLOSET SUPPLY-TANKS.—William Bunting, Jr., Boston, Mass.
332,643. MACHINE FOR EDGING AND SEAMING TIN ROOFING.—Julius J. Cowell, Weedsport, N. Y.
332,655. SHUTTER. — Richard Hammill, Chicago, Ill.
332,673. COUPLING FOR LIGHTNING-RODS. — Alvin J. Munson, Indianapolis, Ind.
332,701. ANCHOR-BOLT. —William S. Craig, Springfield, O.
332,702. FLAT WIRE NAIL.—Chas. W. Dean, South Wareham, Mass.
332,720. ROOF.—Aaron L. Lindsley, Chicago, Ill.
332,722. ART OF PRODUCING OPEN-WORK PANELS. —Frederick Mankey, Williamsport, Pa.
332,723. CORNICE. — Frederick Mankey, Williamsport, Pa.
332,748. STEAM-BOILER.—John F. Pease, Syracuse, N. Y.
332,758. TANK FOR WATER-CLOSETS. — James W. Somerville, Washington, D. C.
332,773. SASH-CORD FASTENER. — William Alfick, Dayton, O.
332,776. OPERATING MECHANISM FOR ELEVATORS.—Norman C. Bassett, Chicago, Ill.
332,794. TRANSOM-LIFTER. — Gilbert J. Dickson, Albany, N. Y.
332,801. DIE-STOCK. — Joseph H. Hines, Calistoga, Cal.
332,810. CHIMNEY-CAP. — John McDonald, Norwood, Mass.
332,811. HOUSE-RAISING APPARATUS.—Thomas F. Maher, San Francisco, Cal.
332,814. HYDRAULIC BRICK-MACHINE.—Samuel E. McGregory and Julius J. Koch, St. Louis, Mo.
332,835. COMBINED SHUTTER - FASTENER AND SHUTTER-BOWER. — Fred. C. Robinson, New York, N. Y.
332,849. MORTISE-LOCK.—George Voll, Cincinnati, Ohio.
332,864. LUMBER-MEASURE. — Emmet N. Barker, Kent, Ohio.
332,886. WRENCH. — Morgan Gale, Corozal, San Salvador, Central America.
332,906. EXPANSION-FLANGE CONNECTION. — Gustavus A. Karwiese, New York, N. Y.
332,909. NAIL-EXTRACTOR.—Isaac H. Kizer, Riverside, Cal.
332,911. OVERFLOW - TRAP FOR WASH - BASINS, BATH-TUBS, ETC. — Stephen Lane, Jr., New York, N. Y.
332,915-916. STONE-DRESSING MACHINE. — Frank Manning, Ardmore, Pa.
332,942. MOLDING-CLAMP.—Charles A. Phelps and William W. Sterns, Humboldt, Iowa.
332,966. LOCK.—John C. Taylor, Niles, Mich.
332,976. LOCK.—Chas. F. Veit, London, Eng.
332,991. LUMBER-DRYING PLATEN.—Nathaniel S. Bouton, Hyde Park, Ill.
332,995. DOOR-LATCH.—William G. Cline, Gallatin, Mo.
332,999. STONE-DRESSING MACHINE. —Henry Donnelly, Sutherland Falls, Vt.
333,009. LEVELLING INSTRUMENT.—John D. Haithcock and William T. Suit, Wilton, N. C.
333,011. METHOD OF SEALING THE JOINTS OF GAS-MAINS.—W. A. Hoeveler, Pittsburgh, Pa.
333,022. KEEPER FOR KNOB - LATCHES. — Henry Morton, Branford, Conn.
333,063. ANNUNCIATOR. — Delavan S. Foote, Chicago, Ill.
333,089. HOT-AIR REGISTER. — Arthur C. Tuttle, New York, N. Y.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—Since our last report six permits have been granted, the more important of which are the following: —
Sarah DeWolf, three-st'y brick warehouse, n e cor. Gay and Front Sts.
James H. McAfee, 9 two-st'y brick buildings, w s Holland Alley, n Biddle St.
Chas. Milske, 8 two-st'y brick buildings, e s Castle St., n Jefferson St.
Louis Unkel, etc., 2 two-st'y brick buildings, w s Chester St., s Orleans St.

Boston.

BUILDING PERMITS. — *Wood.* — *Keyes St., No.* 113, stable, 17' x 20'; owner, Richard Corcoran; builder, John Gately.
Highland St., No. 19, dwell., 29' x 37' 6"; owner, George Curtis; builder, B. C. Tinkham.
Marginal St., No. 283, mechanical, 23' x 30'; owners, Fitch & Joy; builder, A. D. Dodge.
La Grange St., w Centre St., boiler-house, 20' x 30'; owners and builders, F. P. Robinson & Co.
Adams St., No. 800, cor. Granite Ave., stores, 16' x 18'; owner, C. Pevear; builder, A. H. Pearce.
Charles St., n Poplar St., dwell., 22' x 30'; owner, Isaac Hemmen; builder, G. W. Stevens.
New Congress St., nearly opp. H St., storage, 15' x 35'; owners and builders, D. B. Ishaw & Son.
Ceylon St., No. 13, dwell., 21' 3" x 45'; owner and builder, W. L. Lewis.
Sedgewick St., cor. Andrews St., dwell., 35' x 38'; owner and builder, John D. Wester;
Gates Sts., Nos. 61-69, dwells., 22' 9" x 35': owner and builder, John McNamara
Magnolia St., Nos. 18-28, dwells., 23' x 61'; owners and builders, F. M. & G. Frost.
Ballou Ave., w Jones Ave., dwell., 13' 6" x 33'; owner, Elizabeth O'Neil; builder, W. M. McLaughlin.
Ballou Ave., w Jones Ave., dwell., 13' 6" x 33'; owner, M. A. McTighe; builder, W. M. McLaughlin.
Walnut St., near Spring St., manufactory, 25' x 50'; owner and builder, A. W. Peters.

Brooklyn.

BUILDING PERMITS.—*Jefferson St., No.* 200, three or four-st'y frame tenement, tin roof; cost, $4,000; owner, Catharine Reiner, 198 Jefferson St.; architect, G. Hillenbrand; builders, J. Wagner and F. Dreher.
Flushing Ave., Nos. 924, 926 *and* 928, 3 three-st'y frame stores and tenements (brick-filled), tin roof; cost, each, $3,100; owner, Henry Stebing, 30 Monteith St.; architect, E. Schrempf; builders, B. Kramer and H. Stebing.
Madison St., s s, 100' w Howard Ave., 3 two-st'y brick dwells., tin roofs; cost, total, $12,000; owner and builder, Fred. Stemler, 1344 DeKalb Ave; architect, F. Holmberg.
Hart St., s s, 250' w Sumner Ave., 8 two-st'y brick and brown-stone dwells., tin roofs; cost, each, $6,000; owners and masons, Gormley & O'Donoghue, New Lots; architects and contractors, Ames & Waldron.
Halsey St., n s, 75' e Lewis Ave., 5 three-st'y brown-stone dwells., tin roofs; cost, each, $4,500; owners and builders, Wells & Crockett, 243 West Fifty-seventh St., N. Y.; architect, I. D. Reynolds.
Tenth St., s s, 100, e Sixth Ave., 3 two-st'y brown-stone dwells., tin roofs; cost, each, $5,000; owner and builder, C. B. Sheldon, on premises.
Seventh Ave., e s, 60' n Eleventh St., 2 three-st'y brown-stone stores and flats, tin roofs; cost, each, $6,500; owner, Charles Nickenig, 308 Eleventh St.; builder, L. Bossert.
Douglass St., s s, 70' w Fifth Ave., three-st'y brown-stone dwell., gravel roof; cost, $3,500; owner, Geo. R. Brown, 34 South Portland Ave.; builders, S. E. Barnes and J. F. Kentana.
Madison St., s s, 100' w Howard Ave., 3 three-st'y brick dwells., tin roofs: total cost, $7,800; owner and builder, Fred. Stemler, 1344 De Kalb Ave.; architect, F. Holmberg.
Hooper St., s s, 50' w Harrison Ave., three-st'y brick factory, tin roof; cost, $3,000; owner, H. B. Scholes, 119 Bedford Ave.; architect, E. F. Gaylor; builder, S. Haughian.
Hooper St., No. 2 4, three-st'y brown-stone dwell., tin roof; cost, $6,000; owner and builder, E. F. Haight, 254 Hooper St.; architect, E. W. Greis.
Kosciusko St., No. 75, three-st'y brick tenement, felt roof; cost, $5,000; owner, John Jungens; architect, Mr. Hustes; builders, M. Smith and Marinus & Gill.
Bushwick Ave., e s, 225' s Devoe St., three-st'y frame (brick-filled) tenement, tin roof; cost, $5,200; owner, Jacob Schick, North Second St. and Graham Ave.; architect, H. DuBois; builders, M. Metzen and U. Maurer.
Nelson St., No. 161, n s, three-st'y brick tenement, tin roof; cost, $5,000; owner, John Findley, 2 Ridge St., New York; architect, G. Damen; builders, P. McGuinn and J. Skinner.
Park Ave., n s, 361' 8" e Nostrand Ave., 2 three-st'y frame tenements, tin roofs; cost, each, $3,500; owner, W. P. Sturgis, 236 Rodney St.; architect, E. F. Gaylor; builder, not selected.
Greene Ave., s s, 100' e Reid Ave., three-st'y brown-stone dwell., tin roof; cost, $6,500; owner, Mr. Tostevin, 877 Greene Ave.; architects and builders, J. T. Perry & Son.
Keep St., No. 237, two-st'y brick dwell., tin roof; cost, $3,500; owner and builder, E. F. Haight, 254 Hooper St.; architect, E. W. Greis.
Halsey St., n s, 325' w Stuyvesant Ave., 6 three-st'y brown-stone dwells., gravel roofs; cost, $6,000; owner and builder, Wm. Andrews, 270 Clifton Pl.; architect, J. D. Hall.
Halsey St., No. 334, three-st'y brick dwell., excelsior roof; cost, $7,000; owner, Emily F. Mixer, 1523 Pacific St.; architect, J. W. Huestes; builders, M. Smith and T. T. Chaffers.
Ivy St., Nos. 21-27, n s, 230' e Broadway, 4 three-st'y frame tenements, tin roofs; total cost, $14,000; owner, Mrs. Francis Esquirol, 62 Woodbine St.; architect, Th. Engelhardt; builder, R. Wright.
Graham Ave., No. 347, w s, 80' s Conselyea St., three-st'y frame (brick-filled) store and dwell., tin roof; cost, $3,500; owner, John McCrum; architect, Th. Engelhardt; builder, R. Nolen.
Eighth Ave., s w cor. Thirteenth St., three-st'y brick store and dwell., tin roof; cost, $9,500; owner and contractor, Sampson B. Oulton, 188 Thirteenth St.; architect, W. H. Calder; mason, J. Myers.
Lorimer St., e s, 175' s Nassau Ave., 2 three-st'y frame (brick-filled) tenements, gravel roofs; cost, each, $2,500; owners, architects and contractors, Randall & Miller, 68 Nassau Ave.; masons, J. & J. Van Riper.
Patchen Ave., e s, 40' n Decatur St., 2 two-st'y frame (brick-filled) dwells., fire-proof roofs; cost, each, $4,000; owner, James McCormack, 1620 Bergen St.; builders, W. Field & Son.
Ellery St., No. 234, near Throop Ave., three-st'y frame (brick-filled) tenement, tin roof; cost, $3,600; owner and builder, Fred. Elflein, on premises; architect, F. Holmberg.
Fulton St., n s, 165' e Marion St., three-st'y frame store and tenement, tin roof; cost, $4,000; owner and mason, P. C. Kane, 685 Herkimer St.; contractor, J. King.
Melrose St., s s, 100' e Hamburg Ave., 2 three-st'y frame (brick-filled) stores and tenement, tin roofs; cost, $4,300 each; owners and architects, Goldfuss & Eller, 114 Central Ave.; builders, D. Kreuder and W. Bayer.
Jackson St., No. 96, s s, 80' e Leonard St., two-st'y frame (brick-filled) dwells., tin roofs; cost, $3,500; owner, Daniel Carroll, 94 Jackson St.; architect, S. Harbison; builders, J. Bennan and J. Bissum.
Eighth Ave., w s, 20' s Thirteenth St., 5 three-st'y brick (stone-trimmed) dwells., tin roofs; cost, each, $6,500; owner and contractor, Sampson B. Oulton, 188 Thirteenth St.; architect, W. H. Calder; mason, J. Wyeth.
Kosciusko St., n s, 200' w Stuyvesant Ave., 5 three-st'y brick flats, tin roofs; cost, each, $4,500; owner and mason, Thomas Ellson, 1134 Lafayette Ave., architect, Th. Engelhardt.
Stockton St., n s, 90' w Tompkins Ave., 4 three-st'y frame (brick-filled) stores and tenements, tin roofs; cost, $4,200 each; owner and builder, Wm. Mogk, 745 Bushwick Ave.; architect, H. Vollweiler.
Evergreen Ave., w s, 90' s Himrod St., 2 two-st'y frame (brick-filled) dwells., tin roofs; cost, each, $3,000; owner and builder, Geo. Loeffler; architect, H. Vollweiler.
Fifth Ave., s w cor. Carroll St., four-st'y brown-stone store and tenement, tin roof; cost, $12,500; owners and masons, Assip & Buckley, Ninth St. and Fourth Ave.; architect, W. M. Coots; contractor, not selected.
Fifth Ave., w s, 19' 6" s Carroll St., 3 four-st'y brown-stone tenements, tin roofs; total cost, $37,500; owner, architect and builder, same as last.
ALTERATIONS. — *Pierrepont St., No.* 50, new brown-stone building, mansard roof; also two-st'y brick extension, tin roof; cost, $6,600; owner, William Ziegler, Mansion House; architects, Parfitt Bros.
Remsen St., No. 51, four-st'y brick extension, tin roof; cost, $7,000; owner, Fred. B. Dwight, 51 Remsen St.; architects, Parfitt Bros.
Bremen St., Nos. 25 *and* 27, iron beams and girders in ice house; cost, $3,500; owners, Dannenberg & Coles, 31 Bremen St.; architect, T. Engelhardt; builders, G. Lehrian & Sons.
Bremen St., Nos. 25 *and* 27, extension carried up to three stories, also a one-st'y brick extension, gravel roof, new iron beams, etc.; cost, $3,500; owners etc., same as last.

Chicago.

LIST OF CHURCHES, SCHOOL-HOUSES, AND PROMINENT BUILDINGS UNDER CONSTRUCTION DURING THE YEAR 1885.

CHURCHES.—Trinity Methodist Mission Church; cost, $24,000.
Western Ave. Baptist Church, addition; cost, $6,000.
Zion Congregational Church; cost, $30,000.
Church of the Covenant; cost, $9,000.
Church of the Epiphany; cost, $50,000.
Church of the Redeemer; cost, $40,000.
St. Luke's Church Mission House; cost, $2,700.
Welsh Presbyterian Church, basement; cost, $3,000.
Emanuel M. E. Church; cost, $14,000.
Erie St. M. E. Church; cost, $7,000.
Presbyterian Mission Church; cost, $10,000.
SCHOOL-HOUSES.—Three-st'y school-house, Lime St.; cost, $40,000.
Three-st'y school-house, North Sangamon St.; cost, $32,000.
Three-st'y school-house, cor. Ashland and Waubansia Aves.; cost, $40,000.
Three-st'y school-house, Wallace St.; cost, $49,000.
Three-st'y school-house, Ashland Ave.; cost, $49,000.

Three-st'y school-house, cor. Thirteenth Pl. and Hoyne Ave.; cost, $49,000.

Three-st'y school-house, Wilcox Ave.; cost, $40,-000.

Three-st'y school-house, Twenty-first St.; cost, $58.000.

Three-st'y school-house, Hudson Ave.; cost, $55,-000.

Prominent Buildings. — Rialto, nine-st'y office-building; cost, $500,000.

Marshall Field, seven-st'y warehouse; cost, $500-000.

Phœnix Insurance Co., ten-st'y office-building; cost, $400,000.

P. C. Brooks, office-building; cost, $220,000.

Wm. H. Harper, elevator building; cost, $180,000.

J. Clark, six-st'y office-building; cost, $150,000.

Studebaker Bros., eight-st'y carriage repository; cost, $150,000.

Union League, six-st'y club-house; cost, $150,000.

H. M. Kinsley, four-st'y restaurant building; cost, $125,000.

J. H. McVicker, addition to theatre building; cost, $100,000.

H. & A. Keep, six-st'y store building; cost, $100,-000.

J. A. McLennon, five-st'y store building; cost, $100,000.

The Chicago Art Institute; cost, $100,000.

Illinois Vault Co. office-building; cost, $80,000.

J. T. Dale, seven-st'y store building; cost, $80,000.

N. S. Jones, three-st'y dwell.; cost, $75,000.

J. Cudahy, two-st'y dwell.; cost, $60,000.

Conrad Furst, six-st'y store building; cost, $60,-000.

S. A. Yale, stores; cost, $60,000.

C. C. Heisen, six-st'y office-building; cost, $60,000.

Armour Memorial building, cost, $60,000.

Crane Bros., three-st'y factory; cost, $50,000.

W. H. St. Clair, five-st'y store building; cost, $50,-000.

J. B. Clow, six-st'y warehouse; cost, $50,000.

Building Permits. — H. J. Cobb, 2 two-st'y dwells., 76-78 Bellevue Pl.; cost, $8,000; builders, Angus & Gindele.

A. Wolff, 3 two-st'y dwells., 85-87 Thirty-third St.; cost, $10,000; architects, Burling & Whitehouse.

R. Schurig, three-st'y stores and dwells., 576 Wells St.; cost, $6,000; architect, J. H. Huber.

A. M. Forbes, two-st'y barn, 104-106 West Monroe St.; cost, $3,000.

P. Bouch, two-st'y dwell., 490 Wood St.; cost, $3,-500.

Fleetwood & Roberts, 2 two st'y dwells., 3722-3724 Langley Ave.; cost, $10,000; architects, Wheelock & Clay.

V. Cucha, three-st'y dwell., 729 Loomis St.; cost, $4,000.

V. Cuhis, two-st'y dwell., 125 Barber St.; cost, $3,-000.

J. Hoedom, two-st'y dwell., 3324 Vernon Ave.; cost, $7,000; architect, C. M. Palmer.

W. F. Whitman, 2 three-st'y flats, 488-490 Congress St.; cost, $10,000; architect, H. R. Wilson.

T. Nickolson, 2 two-st'y dwells., 163-164 Thirty-fourth St.; cost, $8,000; architect, T. Nickolson.

G. Prens, two-st'y store and dwell., 719 West Eric St.; cost, $2,500.

Wm. Newhouse, two-st'y dwell., 353 Twenty-third St.; cost, $2,750; architect, J. Frank.

T. W. Phinney, barn, Nineteenth St.; cost, $2,-500.

T. B. Schaefer, three-st'y flats, 24 Lane Pl.; cost, $7,000; architect, E. Krauser.

E. E. Snyder, three-st'y store and flat, 458 Ogden Ave.; cost, $3,500.

E. F. Goebel, 3 three-st'y flats, 24-26 Ogden Pl.; cost, $14,000.

R. C. Rounswell, two-st'y flats, 2-3 Webster Ave., cost, $5,000; architect, Rounswell.

E. S. Bartin, two-st'y dwell., 3382 South Park Ave.; cost, $6,000; architect, J. A Heath.

J. L. Stagg, two-st'y dwell., 3147 Calumet Ave.; cost, $7,000; architect, W. A. Furber.

W. L. Lindley, two-st'y dwell., 3143 Calumet Ave.; cost, $6,000; architect, W. A. Furber.

New York,

City Work. — For the Commissioners of Charities and Corrections, receiving and storage rooms are to be built at the foot of East Twenty-sixth Street, and improvements made to the "Tombs," from designs of Messrs. N. Le Brun & Son.

For the Board of Health, 10 one-st'y pavilions, 22′ x 75′ each, are to be built at North Brother Island, at a cost of $10,000.

Also a two-st'y brick and stone pavilion, 85′ x 165′, on Hart's Island, to cost $40,000, from plans of Mr. Jos. M. Dunn.

Factories. — Mr. Peter M. Wilson will have a six-st'y factory-building, with a frontage of 117′ 6″ on Greenwich St., 76′ on Hudson St., and 37′ on Bank St.; cost, $60,000; Messrs. D. & J. Jardine, architects.

Messrs. S. Ottenberg & Bros. will build a factory and tenements covering a lot 100′ x 100′, on the n w cor. of Third Ave. and Ninety-sixth St.

Mr. F. Leissner will build an extension to his factory on the s s of Seventy-first St., 45′ w of Ave. A.

Houses. — On the s w cor. of Seventy-fifth St. and Eleventh Ave., 5 houses are to be built for different owners, from plans of Messrs. Berg & Clark.

Stores. — Messrs. Ehrich Bros. will erect a store, to occupy lots No. 216 to 228 West One Hundred and Twenty-fifth St.

Building Permits. — *Washington Ave.*, w s, 220′ s One Hundred and Seventieth St., two-st'y frame building, flat mansard tin and slate roof; cost, $3,500; owner, Henry A. Sherwood, 1341 Washington Ave.; architect, W. W. Gardiner, 1316 Washington Ave.

Lexington Ave., No. 225, two-st'y brick stable, flat tin roof; cost, $9,000; owner, John J. Wysong, 137 Madison Ave.; builders, Robinson & Wallace, 129 East Twenty-third St.; architect, Henry Kilburn, 229 Broadway.

Park Ave., s e cor. Eighty-eighth St., 2 five-st'y brick tenements, flat tin roof; cost, $43,000; owner, Chas. E. Clark, 124 East Eighty-seventh St.; architect, G. A. Schellenger, 128 Broadway.

Madison Ave., w s, n w cor. One Hundred and Twenty-seventh St., 6 four-st'y brick dwells., flat and mansard pitch tin roof; cost, $60,000; owner, Geo. Kuhn, 617 West Sixty-seventh St.; architect, Alex. P. Finkle, 169 and 171 West Broadway.

One Hundred and Thirty-second St., n s, 115′ e of Seventh Ave., 3 three-st'y brick dwells., flat tin roofs; cost, $24,000; owner, W. J. Gessner, 1722 Madison Ave.; architect, Wm. G. Steinmetz, 76 Astor House.

Franklin Ave., w s, 230′ n One Hundred and Seventieth St., 3 two-st'y frame dwells., flat tin roofs; cost, $10,500; owner, Thos. McMahon, Sulten Pl. near Fifty-eighth St.; architect, W. W. Gardiner, 1364 Washington Ave.

Third Ave., s w cor. Seventy-seventh St., 4 five-st'y brick tenements, flat tin roofs; cost, $80,000; owner, Maurice Moore, 1674 Third Ave.; architect, Arthur L. Meyer, 57 Broadway.

St. Louis.

Building Permits. — Nineteen permits have been issued since our last report, four of which are for unimportant frame houses. Of the rest those worth $2,500 and over are as follows: —

Missouri Car and Foundry Co., one-st'y iron-clad forge-house; cost, $5,000.

J. A. Minks, 4 adjacent one-st'y brick stores; cost, $3,500; George Steineger, contractor.

Mrs. L. C. Williams, 6 adjacent two-st'y brick dwells.; cost, $15,000; C. C. Helmers, architect; Chas. Gerhardt & Son, contractors.

Mrs. M. A. McMenamy, 2 adjacent brick dwells.; cost, $4,700; J. G. Cairns, architect; P. Brennan, contractor.

H. Jans, Sr., three-st'y brick and stone store and hall; cost, $18,000; F. J. Capitain, architect; contract sub-let.

Wm. Riley, two-st'y brick dwell.: cost, $3,800; Thos. J. Furlong, architect; J. H. Kuft, contractor,

F. W. Humphrey, three-st'y brick store and office; cost, $4,000; C. C. Hellmers, architect; Chas. Gerhardt, contractor.

General Notes.

Windsor, Vt. — The town has voted an appropriation of $15,000 to build a new school-house on the site of the present one adjacent to the town-hall.

Worcester, Mass. — J. E. & A. E. Estabrook are to build an addition to their machine shop at the cor. of Beacon and Hermon Sts., 50′ x 110′, four-st'y.

COMPETITION.

COTTON EXCHANGE.

[At Savannah, Ga.]

The Savannah Cotton Exchange invites plans for a cotton exchange building to be erected in the city of Savannah, Ga. For particulars, address

J. B. DUCKWORTH,
Chairman of Committee.

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PROPOSALS.

IRONWORK.

[At Lynchburg, Va.]

Office of the Supervising Architect,
Treasury Department,
Washington, D. C., December 18, 1885.

Sealed proposals will be received at this office **until 2 P.M., on the 4th day of January, 1886,** for furnishing and fixing in place complete the iron columns for the first story, and all iron beams, girders, etc., for the first, second and third story floors of the court-house, post-office, etc., building at Lynchburg, Va., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office, or the office of the superintendent.

Bids must be accompanied by a certified check for $300. M. E. BELL, Supervising Architect.

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IRONWORK.

[At St. Joseph, Mo.]

Office of the Supervising Architect,
Treasury Department,
Washington, D. C., December 23, 1885.

Sealed proposals will be received at this office **until 2 P. M., on the 11th day of January, 1886,** for furnishing and putting in place complete the iron beams, girders, etc., required for the first story floor of the post-office, etc., building at St. Joseph, Mo., in accordance with drawing and specification, copies of which and any additional information may be had on application at this office or the office of the superintendent.

Bids must be accompanied by a certified check for $300.

523 M. E. BELL, Supervising Architect.

MONUMENT.

[At Charleston, S. C.]

Charleston, S. C., November 28, 1885.

Bids will be received **until 12 M., January 15, 1886,** for furnishing and setting all the granitework necessary for the Calhoun Monument, at Charleston, S. C., and for setting five bronze statues, all in accordance with plans and specifications for same, which will be furnished to intending bidders, upon application to the undersigned.

The right to reject any or all bids is reserved.

The successful bidder will be required to give bond for the faithful performance of the work.

LOUIS DeSAUSSURE,
C. IRVINE WALKER, Committee.
SAML. B. PICKENS,

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SCHOOL-HOUSE.

[At Cincinnati, O.]

Sealed proposals will be received at the office of the Board of Education, Public Library Building **until 12 o'clock, noon, Monday, January 18, 1886,** for labor and material required for building addition to the Twenty-eighth District School-Building, Browne St.; also, for building new school-house, twelve (12) rooms on Thirteenth District colony lot, Vine St., according to plans and specifications on file at the office of Superintendent School Buildings, No. 287 West Ninth St., Cincinnati, O.

Bids must be upon blank forms to be obtained at this office.

Each bid must contain the name of every person interested therein, and must be accompanied by a sufficient guarantee of some disinterested person in a penalty equal to the amount of the bid; that if the bid is accepted a contract will be entered into, and the performance of it properly secured.

All bids must be addressed to George O. Dechebach, Chairman Building Committee, and plainly marked bid for the Thirteenth District or Twenty-eighth District improvement.

The right is reserved by the Board to reject any or all bids. By order of the Board of Education.

524 ROBT. G. STEVENSON, Clerk.

BRIDGE.

[At Omaha, Neb.]

Board of Public Works,
Omaha, Neb., October 29, 1885.

The Board of Public Works of the City of Omaha, Neb., invite proposals **until 2 o'clock, P. M., January 9, 1886,** for the construction of a viaduct on Eleventh Street, over the tracks of the Union Pacific and Burlington & Missouri River Railroads.

Proposals must be based upon the specifications and outline plans on file in the office of the Board of Public Works, copies of which will be furnished upon application.

Bids are to be accompanied with detail drawings and strain sheets, and shall specify the cost of superstructure for a 20-foot roadway and a 30-foot roadway, and shall separate the superstructure from the foundation work.

Each bidder shall deposit with his proposal a certified check, payable to the undersigned, in the sum of one thousand dollars, to be forfeited to the City of Omaha in case he shall fail to execute a contract and bond satisfactory to the Board within twenty days after the notification of the award, should his proposal be accepted.

The Board reserves the right to reject any or all bids. The Board of Public Works,

523 J. E. HOUSE, Chairman.

POST-OFFICE.

[At Peterborough, Ont.]

Department of Public Works,
Ottawa, December 7, 1885.

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Public Buildings, at Peterborough, Ont," will be received **until Tuesday, the 20th day of January next,** inclusive, for the erection of public buildings, for the post-office, and the customs and inland revenue offices, at Peterborough, Ont.

Plans and specifications can be seen at the Department of Public Works, Ottawa, and at the office of J. E. Belcher, Architect, Peterborough, on and after Friday, the 18th day of December next.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied and signed with their actual signatures. Tender for each building to be separate, and forms will be supplied for each.

Each tender must be accompanied by an *accepted* bank check, made payable to the order of the Honorable the Minister of Public Works, *equal to five per cent* of the amount of the tender, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted, the check will be returned.

The Department does not bind itself to accept the lowest or any tender. By order,

524 A. GOBEIL, Secretary.

CANAL SINKS, ETC.

[At Welland Canal, Canada.]

Department of Railways and Canals,
Ottawa, December 9, 1885.

Sealed tenders, addressed to the undersigned and endorsed "Tender for the Welland Canal," will be received at this office until the arrival of the Eastern and Western mails, **on Monday, the 25th day of January next (1886),** for raising the walls of the locks, weirs, etc., and increasing the height of the banks of that part of the Welland Canal between Port Dalhousie and Thorold, and for deepening the summit-level between Thorold and Ramey's Bend, near Humberston.

The works throughout will be let in sections.

Maps of the several localities, together with plans and descriptive specifications, can be seen at this office on and after Monday, the 11th day of January next (1886), where printed forms of tender can be obtained.

A like class of information relative to the works north of Allenburg will be furnished at the resident engineer's office, Thorold; and for works south of Allanburg, plans, specifications, etc., may be seen at the resident engineer's office, Welland.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and, in the case of firms, except there are attached the usual signatures, the nature of the occupation and place of residence of each member of the same; and further, an accepted bank check for the sum of two thousand dollars or more, according to the extent of the work on the section, must accompany the respective tenders, which sum shall be forfeited if the party tendering declines entering into contract for the works, at the rates stated in the offer submitted.

The amount required in each case will be stated on the form of tender.

The check or money thus sent in will be returned to the respective parties whose tenders are not accepted.

This Department does not, however, bind itself to accept the lowest or any tender.

525 By order, A. P. BRADLEY.
Secretary.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 524.

JANUARY 9, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

A SUIT of great interest to the profession has been begun in the United States Circuit Court in New York, by Mr. Henry G. Harrison, the architect of the great Garden City Cathedral, to recover from the Stewart estate compensation for his services in connection with the cathedral and its decorations, and the subsidiary buildings belonging to it. The claim is for about ninety-six thousand dollars, the balance due after deducting eighteen thousand dollars, which has already been paid, from commissions amounting to one hundred and eleven thousand dollars, and cash advances of three thousand more. According to the New York papers, the items of Mr. Harrison's account seem to be fair enough. He charges five per cent on the cost of the cathedral building, which he estimates at a million-and-a-half, not having been allowed, as he says, to know the exact cost. Ten per cent commission is charged on the cost of the baptistery, with the marble floors, and the elaborately-wrought bronze and wood fittings; and twenty per cent on the cost of the Stewart mausoleum, the bronze gates, the richly-sculptured marble altar and font, the gas-fixtures, organ-case, bishop's throne, credence, pulpit and lectern, and a portion of the stained glass, with heraldic work. The rest of the bill is for cash advances to pay for travelling expenses, for modelling, for perspective and landscapes, for small-scale drawings, for drawings for the See House, for other extra drawings, and for the credence. There is nothing out of the usual course in any of these items, as reported; and the defence will be, it is said, that Mr. Harrison, although employed at one time, has not had for several years anything to do with the cathedral work, and that he has been paid all that was due him. Of course, we know nothing of the facts as to how much of the work Mr. Harrison may have done, but if he only did one-seventh of it, and some one else the remaining six-sevenths, it is a little singular that his name should be the one commonly connected with the building.

MR. ROWLAND R. HAZARD, a man of considerable note in connection with semi-scientific enterprises, has surpassed himself in the production of a scheme for an underground railway, which certainly seems to possess most of the merits of the systems hitherto suggested, without the defects of some of them. The main idea appears to have been borrowed from that of the original Broadway Arcade Railroad, which proposed to excavate the whole of the street, from curb to curb, some fifteen feet deep, and to replace it by a structure of iron columns and beams, carrying an iron roof, upon which a new street pavement was to be placed. Mr. Hazard's plan, like this, is to excavate the street between the curbs, and fill the excavation with a structure of iron beams and columns; but he improves upon the Arcade by separating the six parallel sections of which his road consists by partitions of "fer-flax," which is a sort of fibrous material, made with steel wire and hemp, woven together and saturated with linseed oil. This material, which deserves a better name, is to be used for the cars, which are to run on the railway in the arcade, these being formed of light steel frames, filled in with the "fer-flax" felt, which is to be pressed into suitable forms. As applied to Broadway, where it is intended to try the first experiments, the two exterior sections of the arcade will be used to contain gas, sewer and water pipes, and electric wires; and the other four will be occupied by tracks, of which the two inner ones will be used for express trains. The stations will be built of "fer-flax," and bridges will be provided at the express stations, so that passengers can reach their trains without crossing the other tracks. The principal obstacle to carrying this clever scheme into execution would seem to be the fact that the Arcade Railway Corporation already has the right to occupy Broadway; but as the charter of the Arcade Company will be forfeited unless it completes its lines from the Battery to Forty-second Street before the first day of next July — which it is very unlikely to do — the persons interested in the new project expect to have the field to themselves after that time. If the road is built, it is intended to move the cars over it by means of electricity. The conditions for this would be unusually favorable, and it is believed that trains could be run without difficulty at the rate of fifty miles an hour.

THE Massachusetts Drainage Commission, which was appointed last year to consider the subject of the drainage of the populous district about Boston, has prepared for presentation to the State Legislature a report, of which we find abstracts in the daily papers. The subject is one of great importance to the inhabitants of the suburban towns which virtually form a part of Boston, and the report, though open, as we think, to criticism, is interesting and valuable. The first criticism which we should be disposed to make upon it would be, that the Commission seems, throughout its deliberations, to have been altogether too much influenced by the recollection of the gigantic scheme for a Metropolitan system of sewers, which was devised by a similar board two or three years ago, and so vigorously pushed in the Legislature that it came near being adopted, to the ruin of most of the towns in Middlesex County. That scheme proposed the construction of two enormous sewers of indefinite length, running in the valley of the Charles River, one on each side of the river, which should receive the drainage of all the towns in the valley, and convey it into the great sewer which already carries the sewage of Boston out to sea. The audacity of this plan seems to have blinded not only many members of the Legislature, but some, even, of the citizens and officials of the towns which would have been ruined by it, to its preposterous lack of common-sense; and the house-owners of Middlesex County narrowly escaped being compelled to mortgage their homes to pay engineers and contractors for building two extravagantly costly tunnels to carry out to sea the flow from sewers which do not exist anywhere on the line of one tunnel, and only in a small portion of one town, immediately adjoining Boston, on the other, and which, if they did exist, could be provided with a better outfall at a small fraction of the cost of the huge Metropolitan sewers.

AS we have said, the present Drainage Commission seems to have felt itself under obligation to treat this plan, which it received from its predecessor, with a consideration which it does not deserve, and all the recommendations which it proposes to make to the Legislature are based on the Metropolitan scheme, with, we are glad to see, the effect of making the latter seem more irrational than ever. The commissioners begin by describing the four modes of sewage disposal now in use, and, after expressing the opinion that delivery into the ocean is the best of all methods, pronounce this to be impracticable in the present case. The other systems, of downward filtration, irrigation and chemical precipitation are next considered. The last is regarded as "unadvisable for adoption" in Massachusetts; the second, "although some excellent results have been obtained at Pullman," is disposed of with the conclusion that "the attempt to utilize sewage as a fertilizer is not likely to prove successful in this State;" and the first, that of downward filtration, is finally recommended as best suited to the conditions. So far, we need not quarrel with the Commissioners; but the scheme which they recommend for

applying the method of disposal by filtration to the towns in the Charles River valley is such a startling one that, if we were not aware of the influence which the Metropolitan project must have had upon their minds, we should hardly be able to regard it as a serious proposition. In brief, the Commission advises that the sewage of the whole Metropolitan district should be transported from eight to fourteen miles, under, or over, two navigable rivers, to the marshes of Saugus, where it is to be distributed over the ground for filtration, and the filtrate allowed to flow into Lynn Harbor, to find its way out to sea as best it can, along the west shore of the peninsula of Nahant. We must confess that the reasoning which led to the recommendation of this scheme is to us incomprehensible. If filtration is the best way of disposing of the sewage of small towns, when they have any to dispose of, we cannot see why the operation should not be performed within the limits of those towns just as well as in Saugus. If filter-beds would be offensive in Newton, they would be a thousand-fold more so in Saugus, where the combined flow of liquid filth would not only be twenty or thirty times greater in volume than in any one of the separate towns of the system, but would reach the ground in an advanced state of decomposition; and huge filter beds in Saugus, just southwest of the large city of Lynn, would give greater annoyance than could ever be caused by small ones in the separate towns, while the difference in cost between conveying the sewage to Saugus and treating it at home would be many millions of dollars. It may be said that the proximity of Saugus to the sea affords a better opportunity for getting rid of the filtrate than could be found anywhere else; but here a dilemma presents itself; if the filtrate is offensive, the people of Lynn and Nahant ought not to have it poured into their harbor; and if it is not offensive, it can just as well be kept in the towns to which it belongs, and allowed to flow into the tidal rivers close at hand. In point of fact, if purification by downward filtration is properly carried on, the effluent liquid is not offensive, and may, with propriety, be allowed to flow into any river, so that there is not, so far as we can see, any argument for transporting the Middlesex County Sewage to Saugus which cannot be urged with still greater force in favor of keeping it at home.

WHETHER downward filtration or irrigation is the best mode of disposal depends on circumstances, and, with such a quantity of putrescent domestic and manufacturing wastes as might be accumulated at Saugus if this plan were carried out, and sewers built in the country towns to supplement it, it is quite likely that the opinion of the Commissioners' engineer is correct; but if the matter were left to the individual towns, as it should be, there is no reason why either system should not be adopted, according to circumstances. In Chelsea and Cambridge, for instance, where land is dear, filtration may be the most economical method of disposal, but Belmont, Arlington, Waltham, Newton, and most of the other towns in the Metropolitan district contain thousands of acres of land, now valueless, which are peculiarly adapted for sewage irrigation. So far from irrigation being "unlikely to prove successful in Massachusetts," there are, we venture to say, few places in which so many circumstances favorable to such experiments can be found combined. The climate is mild compared with that of Pullman, while the vast tracts of worn-out and deserted farming land which fill the eastern part of the State are exceptionally adapted for converting, at small cost, into productive territory. In most of the towns an unlimited quantity of such ground can be bought for less than its early possessors paid for clearing the stones and stumps off it, and little remains to do but to apply sewage to it in the simplest way. This done, with proper skill, the result is sure. Some of the "truck farms" near Boston pay more than five hundred dollars annually per acre in net profit, using ordinary fertilizers, and with sewage delivered continually on the ground, and discreetly used, all expense for other manures would be saved. Moreover, used as it should be, sewage from dwelling-houses is quite equal to any other fertilizing application. Lindley, the greatest of horticulturists, wrote, fifty years ago, that the wastes from human habitations, diluted with abundance of water, surpassed in productive power all other manures, natural or artificial, and the testimony of other experts has been almost unanimous, from that time until now, in confirming his opinion. A few years ago the distinguished manager of an experimental farm at Barking, supplied with ordinary sewage from North London, reported that "no amount of ordinary manure" could, as the sewage usually did, enable the farm to produce six or seven crops of grass in a season, each weighing from six to twelve tons to the acre; while with turnips only twenty or twenty-five tons to the acre could be produced by "a good dressing of farmyard manure," against fifty to sixty tons, which was the average product with sewage irrigation alone. This farm was naturally "a poor gravel," like much of the Massachusetts land; and the experiments were carried out at a large scale, four or five hundred thousand tons of sewage being used every year. It is true that most of the sewage farms in England, laid out by engineers instead of farmers, and flooded with enormous quantities of liquid, have never yet been profitable; but the wonderful success of Pullman shows how different the result may become when the work is directed by agricultural as well as engineering science; and even if the crops should prove a dead loss every year, the sewage will at least have been safely and inoffensively disposed of at a cost of less than one-tenth that involved in sending it out to sea by such channels as the Metropolitan system contemplates.

THE business of the Suez Canal has increased rapidly within the last three years, and the widening of the channel, now in progress, has been undertaken none too soon to accommodate the immense traffic which passes through it. In 1883 the tonnage was increased by two hundred and sixty-nine thousand, and the total for the present year will probably exceed nine million. This tonnage probably represents about one ship per hour during the daytime throughout the year. Hitherto the transit has been absolutely restricted to the daylight hours, on account of the danger of collisions, but the strain upon the capacity of the canal has become so great that immense electric lamps have been placed along the banks, and, by a regulation which went into operation on the first of last month, ships-of-war and mail-steamers are allowed to pass at night between Port Saïd and the thirtieth mile-post, on condition that they carry each four electric lights of their own. As vessels of this class, besides their electric lights, are generally furnished with the most improved steering and locomotive apparatus, there is less danger in allowing them to pass through the canal at night than would be the case with many others, while, as they comprise nearly one-quarter of the whole tonnage, and that quarter, moreover, which most needs to make the transit quickly, the new regulation will promote very greatly the convenience of Count de Lesseps's great water-way.

SOMETHING of a novelty in the way of architects' commissions has been introduced by the Corporation of London, which has decided to employ Mr. Horace Jones, the City Architect, and lately President of the Royal Institute of British Architects, and Mr. Barry, a Civil Engineer, to design and carry out the new Tower bridge, which has been so long discussed, and to pay Mr. Jones one hundred and fifty thousand dollars, which is five per cent on the estimated cost, for him to divide between himself and Mr. Barry as he shall judge proper. In such cases hitherto it has been the custom to employ and pay the architect and engineer separately, or to put the matter entirely in the hands either of an architect or an engineer, leaving him to employ in consultation such persons of other professions as he wished. All these courses are open to some objection, and the mutual understanding by which the Corporation was enabled to choose both its architect and its engineer, and to pay them jointly for their services, seems to us to be creditable to all the persons concerned.

AN architect whose name recalls the enthusiasms of the last generation, M. Théodore Labrouste, died recently in Paris, at the age of eighty-six. Although a man of less brilliant talent than his famous brother, Henri, who died some thirty years ago, Théodore Labrouste had completed a most honorable and successful career. In 1827, when a pupil of Vaudoyer and Hippolyte Lebas, he carried off the Grand Prize, and made some remarkably interesting studies of antiquity during his residence at Rome. These brought him reputation and employment, and on his return to Paris he was appointed architect of the College Sainte-Barbe, and after the completion of this great work he executed many others, public and private, of considerable note. During the latter part of his life he was connected, as Government architect, with several important buildings, and served as a member of the jury of the School of Fine Arts.

STROLLS ABOUT MEXICO.[1] — IX.

FROM QUERETARO TO GUANAJUATO.



A Corner of the Plaza, Celaya.

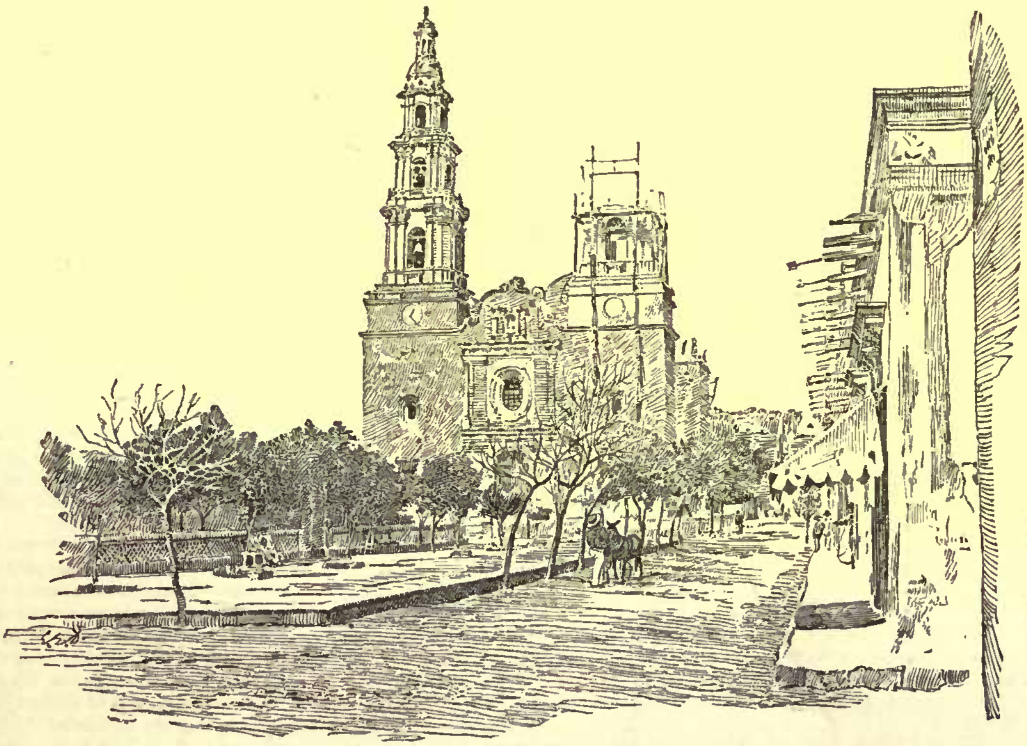
IT is a charming trip in the Querétaro street-cars out to the factory-suburb of Hercules. The cars take a meandering course from the shady Plazo Mayor, out to a clear little stream crossed by massive old stone bridges, and running just at the edge of the city. Then the track runs up the valley of this stream into the Cañada, through a bosky rural lane, with glimpses of the beautiful landscape through the openings of the bordering trees, brown mountains and high, ruddy-faced cliffs, overlooking the fertile valley with its rich verdure; isolated and massive buildings, with brilliant white walls gleaming out from the dark, embowering foliage, and slender cypress spires standing in grave groups around.

The way passes the grounds of what looks like an elegant suburban villa, set far back from the street, amidst beautiful grounds, with the legend "*La Purissima*" inscribed in large letters on the arch over the gate. I learn, however, that it is one of the three mills of the great Hercules Company, the stream falling so rapidly as to produce a good power here, and also still farther down towards the city, as well as for the largest mill which forms the nucleus for the surrounding village. This place, which has something like seven or eight thousand inhabitants, it is said, has, in one respect, a more urban look than the neighboring city itself: this is due to the modern-looking lamp-posts, the place being lit by gas from the factory works, while the city depends upon petroleum lanterns. The population is almost wholly composed of lowly people, who live in humble dwellings, but it has a cheery, attractive aspect, quite in contrast with the air of misery and squal or which characterizes our dingy Northern factory towns. With bright skies, mild airs and beautiful nature always smiling about, there is little to make existence a strife against hostile elements; therefore it is not surprising to meet contented-looking faces, instead of the sullen, scowling features not uncommon among the operative classes to which we have been accustomed at home. In the place of huge and gloomy barracks we find the village composed of little one-story-cottages, sprinkled terrace-like over the hill-side; they are little more than huts, bare of furniture, but attractive with what may be called the instinctive picturesqueness of the land; red-tiled roofs cover them, and flowers bloom gaily about. The people have few of the hostile elements to fight against, which make life a continual struggle for the poor people in our harsh climate; their wants are few, their children sport around naked on their doorsteps and in the streets, and their slender earnings probably go farther, after all, than with our better-paid factory people.

The mills, which are on a large scale, employing something like two thousand hands, are entered through a beautiful garden, with fountains, flowers and orange trees, and a marble statue of Hercules in the centre. The establishment was founded nearly forty years ago, and under the greatest difficulties. All the machinery was brought from the coast at Vera Cruz in carts or on mule-back, something like four hundred miles. There is an enormous over-shot water-wheel brought from Manchester, England, in 1848, and also a powerful American engine recently imported, since the days of the railway, to furnish additional power. The water-supply is a stream produced by tapping the mountain-side, something like a mile farther up the valley, a tunnel having been driven about a half-mile into the rock. The Mexican Central Railway's track passes close to the mouth of the tunnel.

It is a pity that the conditions of manufacturing should be so thoroughly artificial in a place where nature does everything to make it a working-people's paradise, in every respect but the work. The mills are very profitable, but are only made so by the tremendous tariff of the country, which on cotton and woollen goods is protective to the last degree. The cost of manufacturing, by spindle, is something enormous; the hand-looms with which the country abounds, and which form the basis of the real fabric-manufacturing industry of Mexico, could, as Mr. Edward Atkinson says, make almost as good a showing. At San Miguel de Allende, and Saltillo especially, the most beautiful *zarapes*, or blankets, colored with soft-toned native dyes, are woven on these hand-looms. They make fascinating portières and draperies.

Even the labor of Hercules, cheap though it is when reckoned by the daily wages paid, is, in reality, dearer than with us, for the operatives cannot do anything like the amount of work which ours can; therefore it is evident that the prosperity of mills like these cannot last many years; the growing commercial intercourse between the two countries will lead to closer reciprocity in commerce and eventual free trade. Possibly by that time, however, the great cotton-growing regions of Mexico will be better developed, giving cheaper raw material, while the coal mines in the State of Puebla and in the north will be made accessible by rail, giving cheaper fuel, and labor may become better trained; or manufacturing may be diverted to new fields in the working-up of some of the fibrous products with which Mexico is rich. It would be a pity to see such a beautiful factory village as Hercules go to ruin, as it is a model in some respects, and the possibilities for a happy operative class are great; but then, it is a greater pity to see its prosperity based upon making the Mexican peasant pay several times as much for his scanty clothing as he would have to pay, were there an open market in his country for the manufactured goods of the United States.



Parochial Church and Plaza Mayor, Encarnacion da Diaz.

The street-cars continue on through the lovely landscape of the Cañada, out to the baths near the tunnel, forming a favorite excursion for the pleasure-loving Querétanos. The stream comes out of the tunnel at a high temperature, making excellent baths. Outside of the bath-house the water is gathered in a pool, where the poorer classes have the privilege of free bathing.

Leaving Querétaro for the north, the train passes very near the foot of the Cerro de Campanas, and we look back upon the charming city, with its many domes, grouped in one of their finest aspects for composition, light and color. The recollections of the priest who was Maximilian's confessor have been published since my last article was written. It seems that the remarkable beauty of the scene was strong enough to appeal to the unfortunate emperor's eye, even at that tragic moment, for it is related that, as he took his

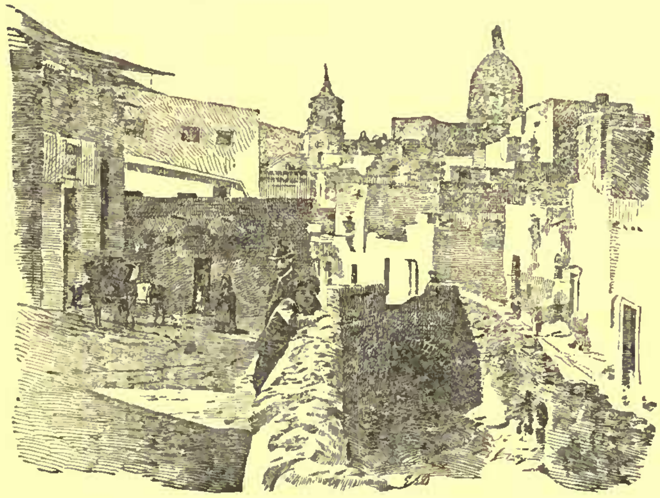
[1] Continued from page 298, No. 511.

place at the hill-side just before the firing of the fatal shot, he exclaimed, as he looked around him: "What a beautiful landscape!"

The valley continues broad and fertile. The interesting city of Celaya is about an hour beyond Querétaro, and the only notable place between is Apaseo, which looks from the train like an attractive town. I remember it chiefly for its handsome church tower—of a type common to this region, from Querétaro north, being Romanesque, square, massive and beautifully proportioned—and for a thicket of oleanders looking over a wall not far from the station; I have passed by there in all seasons, and the mass of deeply-blushing bloom was always to be seen.

At Celaya, the Mexican National Railway, which sometime is to become a rival international line, crosses the Mexican Central on the way north. This junction gives Celaya considerable importance, but it is not that for which we care as we draw in sight of the place, low-lying in the wide level of the plain; it is for the cluster of domes that at once catch the eye as something exceptionally fine, even for Mexican architecture. The city is about a mile from the station, and as we enter it the beautiful structures rise above us in aerial grace. Their perfect forms are clad in glazed tile of a greenish gold, inlaid in various mosaic patterns, not marked enough, however, to break the general tone or color. The material seems, in aspect, to embody the virtues of both mineral and metal. As the domes glitter in the broad sunshine, we are reminded of some peculiar kind of burnished bronze, but as we stand to the westward towards evening, and behold them luminous in the sunset light against the deep purple of the eastern sky, it seems as if they might be blown of delicate amber glass, through which glows a gentle internal fire. These various churches are said to have been built by Tres Guerras, a famous architect of the last century.

A notable feature of Celaya are its thermal baths, supplied by an artesian well something like a thousand feet deep, from which flows a large volume of water at an even temperature throughout the year, just about blood heat, so that a bather may remain in the water for



A Hill-side Way in Guanajuato.

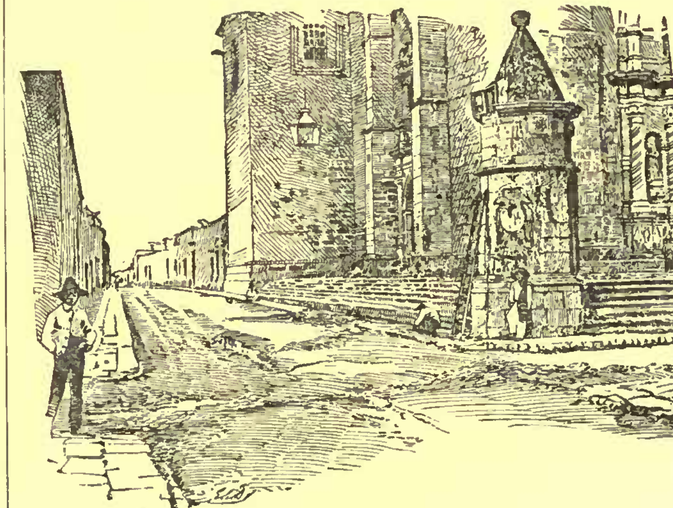
hours without chill or lassitude. A more delicious bath I have never taken, and it is worth one's while to stop over here just for this luxury. The establishment is perfectly appointed, also. There are various bath-rooms, with masonry tanks about five feet by ten with a four-foot-depth of the most limpid water constantly running. Each bather is furnished with a large bath-towel and a sheet, sweetly laundered, a bright brass tray with soap, brush and comb, and a vial of toilet oil, all scrupulously neat. There is also a large swimming-tank in a lofty, hall-like room, with a small tank adjoining for bathers to soap and scrub themselves in, that they may not perturb the crystal clearness of the water in the basin. The walls of this room are frescoed with two panoramic views, which are evidently the pride of the proprietor's heart. They are supposed to be typical Mexican and American scenes, and the proprietor cherishes the fond delusion that the latter is Niagara, but I should say that it must have been copied from some ancient lithograph of the Genesee Falls at Rochester.

The Mexicans, so far as I have observed, surpass us Americans in bodily cleanliness. Here, in the comparatively obscure city of Celaya was not only this bath, such as could hardly be found even in one of our greatest centers, but there were also two other large bathing-establishments. In some Western cities of the size, if a stranger should ask for a bath, he might be in danger of being mobbed and driven out of town for a "dude!" I have been in few Mexican cities of any pretension whatever, where a first-class bathing-establishment was not an old institution. It is one of the pleasant features of travel in the country that, at the end of a day's dusty journey one may enjoy the delight of a refreshing plunge. The number of Mexican cities with warm or hot springs either within their limits or in the immediate neighborhood is something phenomenal. One is almost brought to the conclusion, either that the country is pretty thoroughly sprinkled with these convenient gifts of nature, or that the location of the cities depends upon the fact of the existence of *aguas calientes* near by.

At the railway station in Celaya there is, at the arrival of every train, a clamor of vendors who drive a lively trade with the passengers in the famous *dulces*, conserves of the place: *leche quemada* and *leche envinado con almendras*—burnt milk, and milk flavored with wine and almonds. The milk is condensed to a pasty consistency and highly sweetened, and put up in little round wooden boxes. Other admirable local sweets are marmalades and pastes of guava, orange, quince, pine-apple, fig and chirimoya.

At nearly every prominent railway station the peculiar local products are offered for sale. At Salamanca, not far beyond, leather goods, particularly riding-gloves, are a specialty and very cheap. This is one of the lowest parts of the railway lines on the Central Table-land, and the kindly temperature is indicated in the scanty clothing of the peasants and the light structure of their humble huts, some of which stand near the track.

At Irapuato, we enjoy the luxury of perennial strawberries, for every day in the year the fruit is offered for sale at the station, and it is large and deliciously sweet. Silao, the next important station, is the point of departure for the great mining centre of Guanajuato, the capital of the richest and most populous State in the Mexican republic. Guanajuato, being off the main line and at the end of a short branch railway, is often neglected by tourists. They little dream that they miss seeing one of the most picturesque cities in the world. It lies embraced in the heart of a rugged mountain range, from which a billion dollars have already been taken, and the city still sends out over five million dollars in silver and gold, though mostly the former, every year. The hills are burrowed and honeycombed through and through; many thousands of laborers, like human ants, have borne out of the mines thousands of tons of ore on their backs, and the refuse rock lies around the mouths of the shafts and tunnels in great mounds which, in a flat country, would themselves make respectable mountains. The city, with something like 80,000 inhabitants, lies in the valley depths, and spreading over the



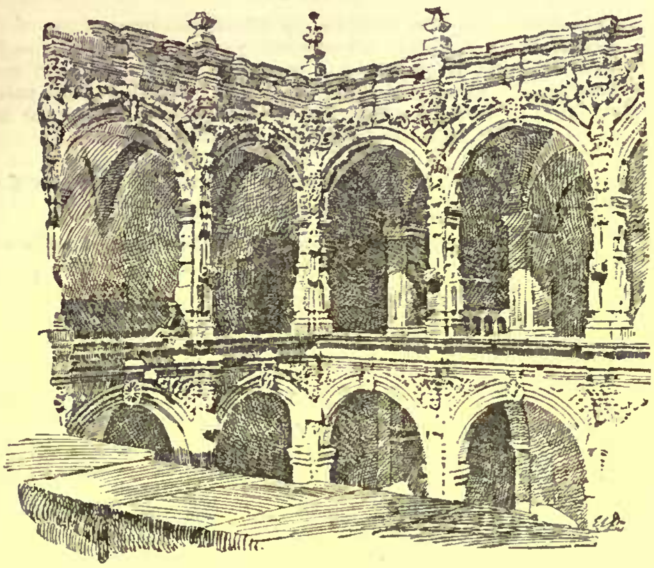
Water-Tower and Church of San Augustin, Queretaro.

slopes with not an even street, and very few that are passable for carriages. The most of the streets are mere rambling lanes, in some of which one can stand in the middle and touch the walls on either hand. Some ascend in steps, some are carried over others on bridges, and some tunnel their way under buildings to their objective points, with many prominent public buildings, and a general construction agreeing with the streets and peculiar contour of the city in irregularity. It need hardly be said that it is a fascinating place for artists, affording subjects for pictures at every turn.

The mining works have nothing of the ugly prosaic character usually typical of modern industry. The buildings are massive and castellated; calculated to offer effective resistance to a mob or insurrection. The mines are mostly at prominent points off on the surrounding mountain slopes, and are marked by large villages huddling around castle-like structures and imposing churches, whose domes crown the whole composition as the Boston State-House presides over Beacon Hill. The environment of Guanajuato looks as if the city were dominated by a syndicate of feudal barons in their strongholds.

There is a handsome building-stone much used in the place, fine-grained, and of stratified shades of delicately varying grayish-green. The new theatre is built of it. It is still unfinished, and stands roofless on one side of a charming little plaza, which is occupied with orange trees and a grass plot, with a bronze statuette of St. George and the Dragon. I would not approve of erecting statuettes on public grounds as a general thing, but the pretty plaza was so diminutive—squeezed, as it were, with its bits of decoration, into about the only level chink where it could find place, that the statuette seemed quite in keeping with its surroundings, and the great theatre was far enough away not to oppress it. So I could not find the heart to ransack my brain for æsthetic motives why it should not be there. The façade of the theatre is nearly enough finished to show the beauty of its Renaissance design, which includes a magnificent portico, with a forest of columns that, as yet, support nothing.

The only pleasure-drive in the city is out to the *presas*, or reservoirs, upon which the city depends for its water supply. A steep and narrow valley is dammed up at intervals, forming a step-like succession of reservoirs which, at the end of the dry season, are emptied down almost to the last drop. At the beginning of the rainy season they draw off the little water remaining over from the previous year, or at least make a pretense of so doing, and this is the



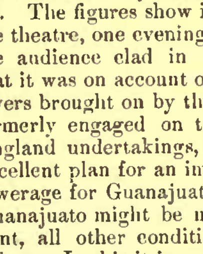
Court of Ruined Convent of San Augustin, Queretaro.

occasion for a great local celebration, or *fiesta*. The reservoirs are bordered by the villas of wealthy citizens, facing a handsome driveway and promenade.

A scarcity of water is the great evil of Guanajuato. The supply is treasured almost like gold, and the precious liquid is doled out at the public fountains under the strictest rules. The uneven character of the ground and the steep declines, are favorable to a good system of drainage, but there is, at certain seasons, not water enough to carry off the sewage. The city abounds with evil smells toward the end of the dry season, and the mortality is then something frightful. The figures show it to reach the character of a pestilence. At the theatre, one evening, I was struck with the large proportion of the audience clad in mourning, and, remarking thereon, was told that it was on account of the loss of so many of the people through fevers brought on by this cause. An American engineer, Mr. Blake, formerly engaged on the Providence water-works and other New England undertakings, has devised what is called by good judges an excellent plan for an improved water-supply and thorough system of sewerage for Guanajuato. It is to be hoped it will be adopted, for Guanajuato might be made one of the healthiest cities on the continent, all other conditions being favorable. Its climate is soft and balmy. In this it is unlike most other mining cities in Mexico, which are situated high up among the mountains, where the temperature is liable to extreme changes, making a climate comparatively harsh for a latitude so southerly.

SYLVESTER BAXTER.

THE SCIENCES AUXILIARY TO BUILDING.[1]



NO one needs to be told that whatever a German does is likely to be done well; and still less is it necessary to remind professional architects and engineers that the German schools of building, partly, perhaps, through the custom which prevails in them of teaching the art of construction to architects and engineers together, and in the same way, are the best in the world; so that one might safely predict that a book upon building science, prepared with the thoroughness characteristic of the nation, and based upon the highly-developed system of technology pursued at the professional schools, would be a model of its kind. Those who have had the advantage of using the admirable little "*Deutsches Bauhandbuch*," a veritable encyclopædia of all the arts of building, will agree with us that in it all reasonable anticipations of what such a work should be are, so far as its dimensions will allow, fulfilled; and it is satisfactory to find that the success of its modest volumes seems to have been so great as to induce its publishers to issue a revision of it, in which the one fault of the original book — its restricted compass — has been somewhat corrected.

[1] "*Hülfswissenschaften zur Baukunde.*" *Unter Mitwirkung von Fachmännern der verschiedenen Einzelgebieet bearbeitet, von den Herausgebern der Deutschen Bauzeitung und des Deutschen Baukalenders.* Being the first part of a new form of the "*Deutsches Bauhandbuch.*" Vol. I. Illustrated with about 1,100 wood-cuts, and 4 colored plates. Berlin: Ernest Toeche. 1885. Price, 20 marks.

The scheme of the "*Bauhandbuch*," or *Building Hand-Book*, was to collect, in a series of five volumes, as much as possible of the special knowledge, including what may be called preliminary science, which architects and engineers, in the course of their education, are accustomed to gather laboriously out of a great number of books, maps, plates and other professional documents. In a small way, the ever-to-be-honored Gwilt did much the same thing for the English architects of the last generation, and won their enduring gratitude in consequence; but Gwilt's precious book is not only far less comprehensive than its German successor, but is rapidly becoming too antiquated for students' use; while its resources, in the shape of plans and diagrams, seem insignificant in comparison with the seven thousand cuts and plates of the German work.

The first two volumes of the set, one of which is now just re-issued in its improved form, contain the *Hülfswissenshaften*, or Auxiliary Sciences. Under this term is first given an excellent chapter on the "Administration of Building Operations," including various tables of weights, measures and foreign money; commercial marks and trade customs relating to the manufacture and distribution of nearly all sorts of building materials; conventional systems of topographical, architectural and engineering drawings; the estimation of quantities and prices, together with that of dilapidations and prospective values; architects' and engineers' fees, and rules governing competitions in various countries; the laws and customs relating to contracts, with details of agreements and specifications for various trades; and the rules of the official building service of the German Government. Next to this comes a chapter on building-laws and police regulations; and then follows the theoretical part of the book, including chapters on Projections and Perspective, Arithmetic, Algebra, Plane and Spherical Trigonometry, Differential and Integral Calculus, Plane and Solid Analytical Geometry; the Theory of Probabilities, Mechanics of Rigid Bodies, Strength of Materials, Elasticity and Torsion, the Statics of Construction, including bridges as well as buildings, and the Mechanics of Liquids and Gases, with Hydrometry, and the theory of Heating and Ventilation, Acoustics, Electricity and Magnetism, Practical Optics and Photography, and Meteorology. The second volume, completing the Auxiliary Science division of the work, which has not yet appeared in its enlarged form, is devoted to the elements of chemistry, with the general technology of combustion and fuels, of gas production and distribution, of the manufacture of brick, terra-cotta, porcelain and glass, the chemistry of mortars and cements, the working of metals, wood and stone, and the properties and construction of various machines and parts of machines, with a treatise on telegraphy, electric lighting, and the electric transmission of power.

The two succeeding volumes of the set are devoted to architectural construction, and will contain, we suppose, substantially the same matter as the corresponding volumes of the "*Bauhandbuch*," although in a less rigidly condensed shape, and with due note of the improvements in the arts of building which have been made within the fifteen years which have elapsed since the "*Bauhandbuch*" was first issued. If this idea of ours is correct, we shall find the first of the two architects' volumes devoted to brickwork and masonry, carpentry, cast and wrought ironwork, roofing, painting, glazing, decoration, plumbing, lighting, heating and ventilation; while the second, the fourth of the complete set, will contain plans and information in regard to city, country and farm-houses, churches, court-houses and schools, military buildings, hospitals and asylums, prisons, official buildings, museums, libraries, theatres, concert-halls, panoramas, assembly-rooms, hotels, bath-houses, banks and exchange-rooms, warehouses, markets, abattoirs, and greenhouses. The last of the five volumes is particularly for engineers' use, and treats of hydraulic work, bridges, roads and railways, metal working, building machinery, and the prevention and extinguishing of fires.

It will be seen that the range of subjects taken up in these five volumes is very extensive, and some of them, in the original work, are, as we can testify from our own acquaintance with it, treated with too much conciseness; but the increased size of the new edition allows space enough for a fuller consideration of these matters, and, judging from the example of the first volume of the new set, the additional space will be wisely used. Although the volume is only of a convenient octavo size, it offers a pretty full treatise on each of the subjects contained in it, that on the Mechanics of Building being particularly modern and interesting; and although it is necessary for this purpose to use small type, with a good many abbreviations, and to print the twelve hundred and odd pages on thin paper, the paper is made so opaque that there is not the slightest annoyance from the showing of the reverse of the sheets through on the face, as is so commonly the case with cheap German books; and the drawing and engraving of the diagrams, the cutting of the type, and the printing of the whole, are so absolutely perfect that the book can be read and studied with greater comfort than many others, which do not contain one-quarter so much matter in the same compass. Most of our readers who understand German probably know something of the "*Bauhandbuch*," so we need only say to them that the new issue, the "*Handbuch der Baukunde*," bids fair to be far better and more useful even than the work which it is intended to supersede. Those who do not read German we should advise, as soon as the second and third volumes appear, containing plans and diagrams of buildings and building work of all sorts, to possess themselves at once of these, which may be had separately, and will be not much less useful to them than if they fully understood the text; and to all

who propose to purchase any of the volumes, we will drop the hint that electrotype plates wear down in time, and that, if they wish for the clearest possible impressions of both text and plates, they will do well to secure early copies.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE CINCINNATI MUSEUM, MR. JAMES W. MCLAUGHLIN, ARCHITECT.

IN September, 1880, Mr. Charles W. West (since deceased) offered $150,000 for the purpose of erecting a museum in Cincinnati, provided his fellow-citizens would contribute an equal sum; the total amount subscribed was $316,000, which will cover the cost of construction of the portion now nearing completion, as shown in dark lines on the ground-plan and entire in the perspective. Mr. West also gave one hundred and fifty bonds of $1,000 each as an endowment fund, which produces an annual income of $10,500. The city ceded to the Museum Association a very commanding site of twenty acres in Eden Park, the surface of the ground being 350 feet above the level of the Ohio River, and the construction of the building was begun in September, 1882. The walls are of local blue limestone, with cornices, arches, etc., of syenitic Missouri granite. The columns at the entrance are of polished granite, from the Bay of Fundy. The roof is covered with red Akron pantiles, bedded in cement, on hollow fire-clay slabs set between the iron T-beams. The entrance hall, 51 feet by 58 feet, which is the most striking feature of the interior, is lined with Bedford, Ind., stone, the columns surrounding the upper galleries of this hall and the lintels above them being of polished dark Quincy granite. The grand staircase is of stone, with polished Knoxville marble foot-rails, newel-posts, etc. The construction of the building is fire-proof throughout, hollow-tile arches and iron beams being used, and the outside walls lined on the interior with hollow-partition blocks. The base and wainscoting of rooms, where not of marble, are of Keene's cement. The picture-galleries on the second floor are spacious, and lighted from above. During the winter the collection will be moved into the new building and arranged for the formal opening to the public in the spring of 1886.

Mr. David Sinton has lately given $75,000 for the construction of an art-school on the grounds of the museum, and $20,000 more will be available for the same purpose from the estate of Reuben R. Springer, deceased. The erection of this building will commence in the coming spring. The will of the late Joseph Longworth conveyed ground-rents to the museum trustees valued at $371,631, the annual income from which, about $15,000, is to be devoted to the support of the art-school.

THE PONTE VECCHIO, FLORENCE, ITALY.

THE Ponte Vecchio is said to have existed as early as the time of the Romans, though of the first structure no traces now remain. In 1080 a new bridge was constructed of wood. After being swept away by a flood in 1177, it was rebuilt in stone, to be again destroyed in 1333, being finally restored in its present plan by the painter and architect, Taddeo Gaddi. During the fifteenth and sixteenth century the butchers of Florence had their shops on the bridge, but the Grand Duke Cosimo I dismissed them, establishing the goldsmiths in their place. Benvenuto Cellini, Ghiberti and several of the Renaissance artists worked here, and the shops are still devoted to the same purpose, both sides of the bridge being lined with small jewelers' establishments — a Florentine Palais Royal in miniature. The bridge is adorned with the coats-of-arms of the various Guilds which contributed to its repair, and bears an inscription commemorating a flood of the Arno. Vasari made use of the shops on the eastern side as a support for the gallery which he built connecting the Palazzo Pitti with the Uffizi. The gallery is still a means of communication, being at present filled with a fine collection of old engravings and prints, and a large number of portraits of members of the Medici family. The view shown in the photo-print is taken from the upper windows of the Gallery of the Uffizi.

ALTAR AND REREDOS, ST. LUKE'S CHURCH, BROOKLYN, N. Y. MR. FREDERICK C. WITHERS, ARCHITECT, NEW YORK, N. Y.

THIS Altar and Reredos were erected by a parishioner of St. Luke's Church, Brooklyn, at the time the chancel was extended, at his expense, by the erection of a sacrarium in the form of a polygonal apse. The altar is of white Vermont marble, seven feet long, with a bas-relief of the Last Supper in the centre, modelled after the picture by Leonardo da Vinci, with figures of kneeling angels at the corners. The reredos is of Caen stone, nine feet in width and ten feet high to apex of centre, and contains the subject of the Crucifixion in high relief, with the figures of SS. John and Mary, standing by the cross. In the niches on either side are statuettes of SS. Peter and Paul, and angels playing on musical instruments crown the four shafts. The steps and risers are of polished marble, the floor is laid with encaustic tiles, and the five windows in the apse are filled with full-length figures, in stained glass, of our Lord and the four Evangelists, made by Heaton, Butler and Bayne, of London.

HOUSE AT GETTYSBURG, PA. MR. J. A. DEMPWOLF, ARCHITECT, YORK, PA.

THIS house has been built for the official residence of one of the professors in the Lutheran Theological Seminary. It stands on the famous Seminary Ridge, about a mile west of the town, and commands from the tower or lookout a complete panorama of the battle-field. It is of frame construction, on a foundation of granite dug from its own site. The total cost has been about $8,000.

WROUGHT-IRON CRANE FOR A FONT-COVER IN THE CHURCH OF ST. MARTIN, YPRES, BELGIUM.

THIS sketch is reproduced from the "*Architectural Association's Sketch-Book.*"

CLOSE OF THE "INVENTORIES."



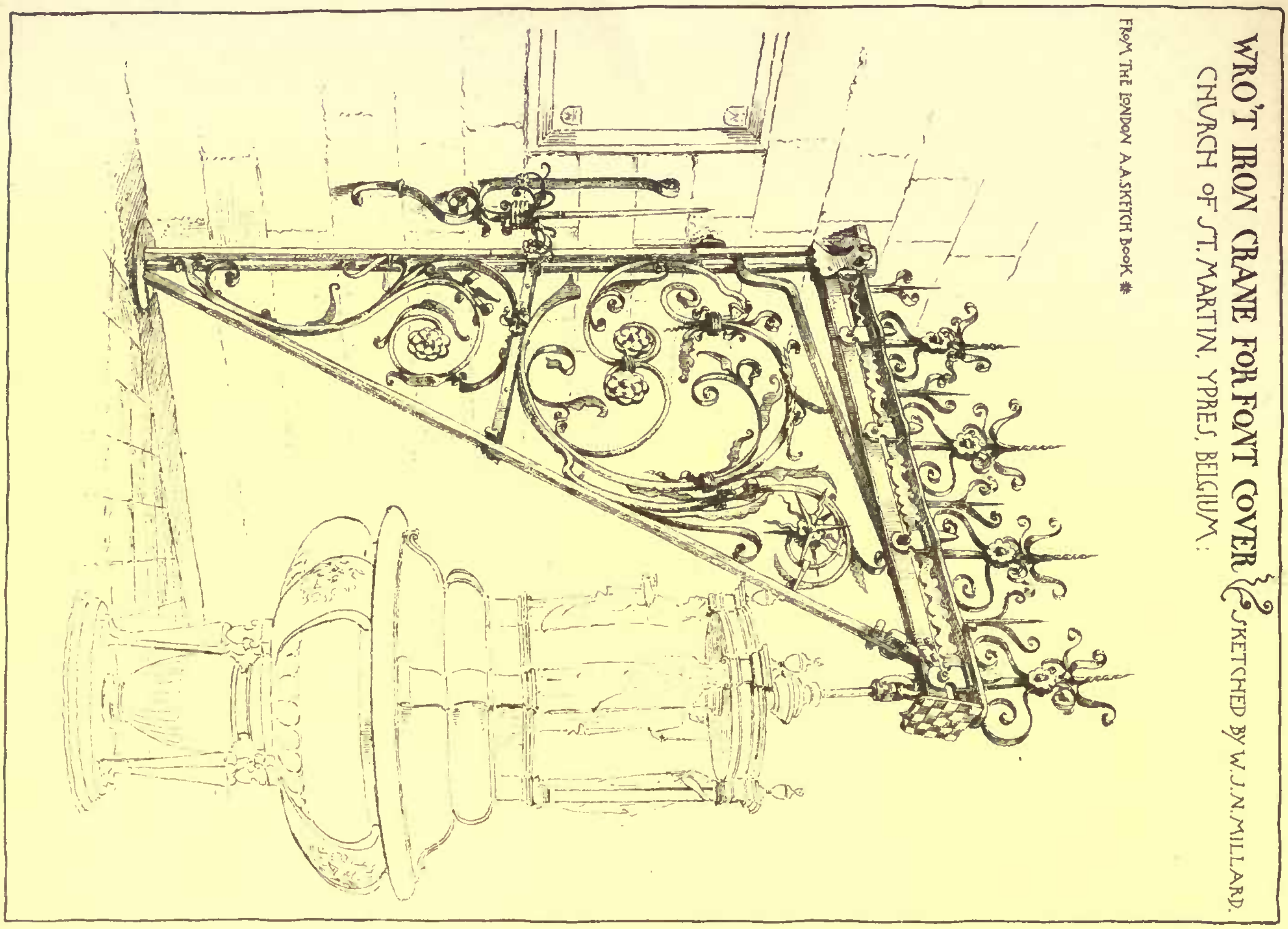
THE International Inventions Exhibition at South Kensington was kept open until the 9th of November, the Prince of Wales's birthday; but notwithstanding the slightly increased duration, there were not so many visitors as to "the healtheries." Last year the number of persons who entered the building exceeded four millions—or say, the population of London, while this year the number has not quite reached four millions, the exact figure being 3,760,581. The reason of this falling off is attributed mainly to the cold and rainy summer, with a succession of wet Wednesdays — the select day, whereas the autumn of last year was uncommonly hot and fine. Moreover, the "Inventories" did not appeal so strongly to the popular interest, and especially the feminine contingent, as did the many food and other processes of last year.

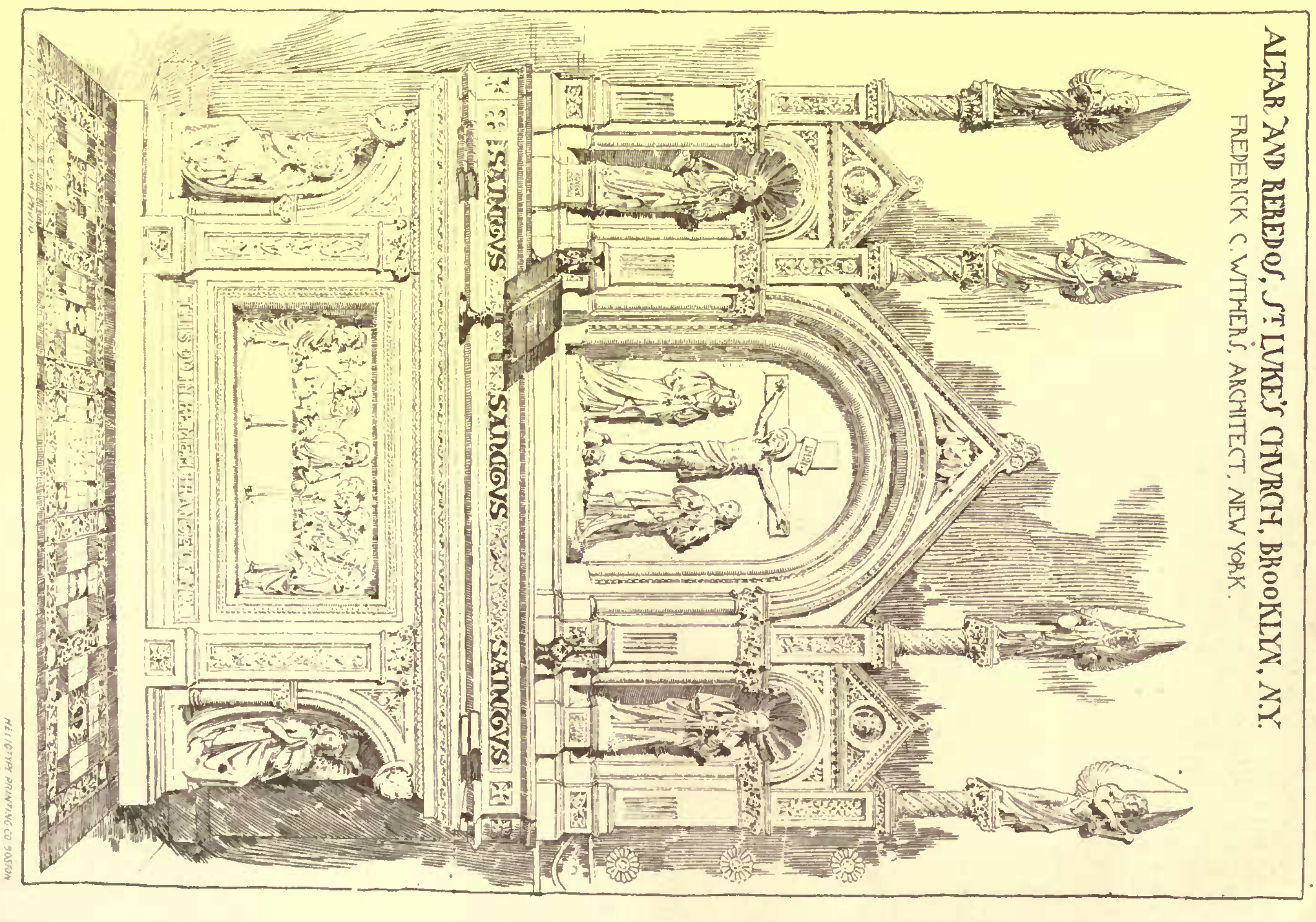
What may be called the extraneous attractions were certainly not diminished. Did not Eduard Strauss bring over his famous orchestra, and the King of Siam's band play their peculiar, but not unpleasing melodies of a decidedly Oriental character? Were there not real live Welsh women in high-crowned hats to illustrate the tedious process of hand-knitting, and set off the more rapid execution of the machine? Could not one ride for a penny "there and back again" on Holroyd Smith's electric-car, or the Mékarski improved air-car? Then the London Water-Examiner, Col. Sir Francis Bolton, surpassed his former efforts with the illuminated fountains, the dancing foam being often lighted up with one color in the middle, and a different one projected onto the outside, thus producing ever-varying and always beautiful effects. The grounds were lighted by myriads of incandescent lamps, marking out the main lines of the buildings, edging the flower-beds and variegating the trees. No great stretch of the imagination was needed to fancy one's self in Fairyland, or taking part in some of the Arabian Nights' Entertainments, when, after the military tattoo had been beaten, the signal was given by a clarion, and the many-hued lamps burst gradually into light. So judiciously was the electric installation arranged by the Siemens firm that the wires were carefully kept out of sight, being concealed by battens into which the lamps were inserted.

Architecture and Engineering Construction were represented by Group III; but it must be confessed that the latter found more ample exemplification than the former, possibly on account of architecture, with the "sanitary" and "unsanitary houses" having entered largely into the Health Exhibition of last year. Still there were new materials and methods of building, some of which will be referred to below, contained in the northern portion of the south gallery. Among the machine tools of Group X, those for wood-working and emery-grinding in the west gallery showed the greatest advance. Lathes and wood-working machines were shown in the American Court, situated in the west central galleries, together with Waltham watch-making machines at work, Delany's multiplex telegraphy, Cameron's ærial ship, the Dennison Manufacturing Company's tag and label machinery, the Troy Laundry Co.'s appliances, a grocer's automatic weighing and parcel-filling machine, a self-lathering shaving-brush, and a boot-finishing machine.

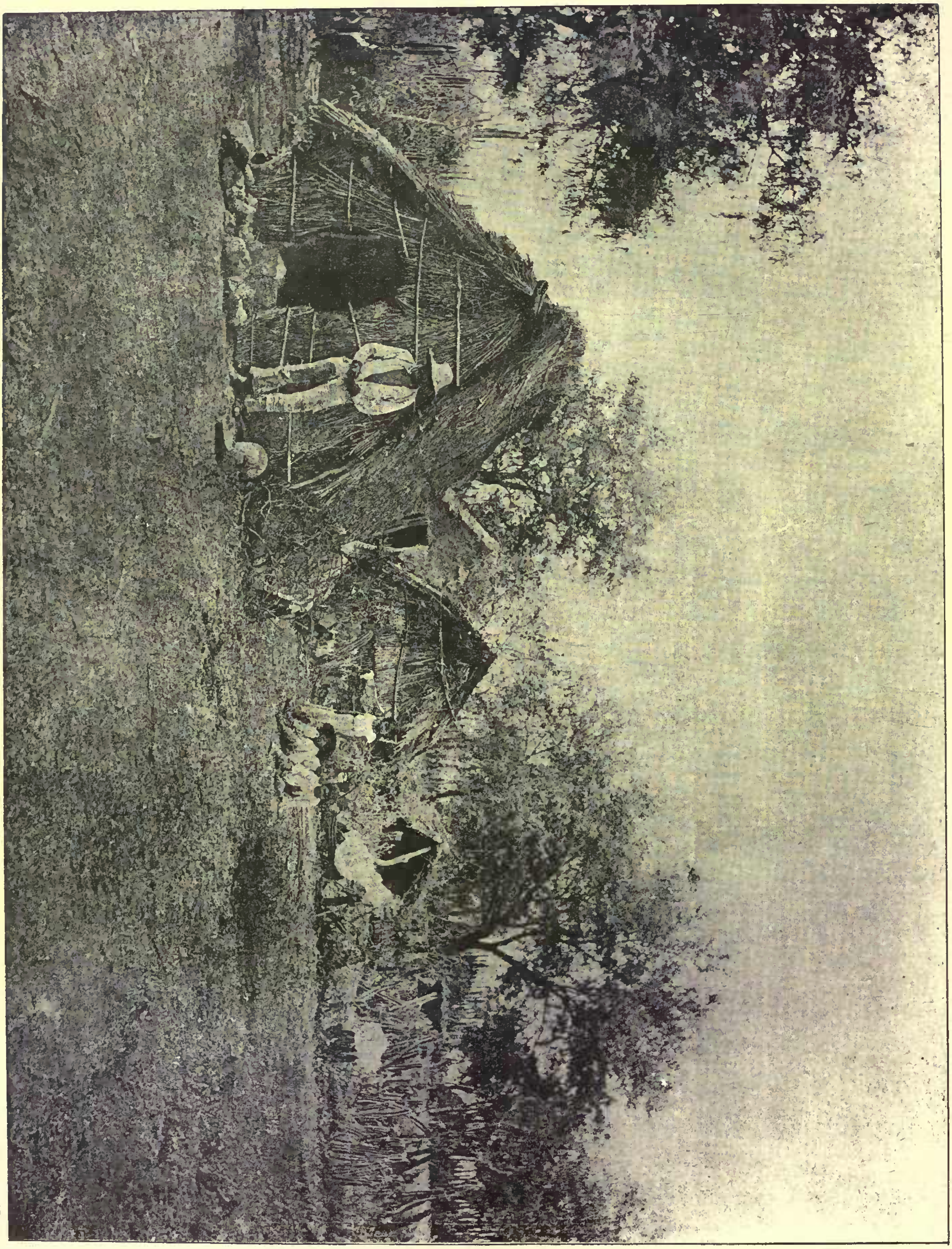
Wall-decorations, floor-coverings and furniture were included in Group XXII, in which Buckingham & Sons of Brussels, made an effective show with carved-oak furniture in the Flemish style and *dinanderies* or brass *repoussé* work, so-called from having first been made in the town of Dinant on the Meuse. It is in this group that were included the handsome furniture and decoration, by the firm of Gillons, for the Prince of Wales's pavilion.

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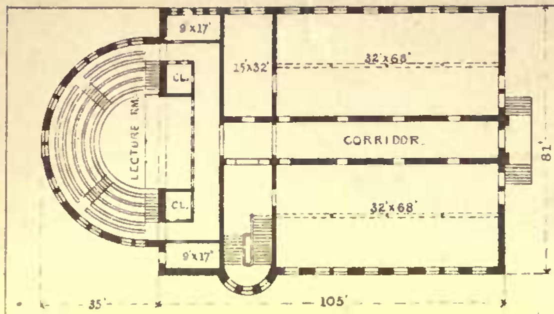


Peasant Huts, Salamanca, Mexico.

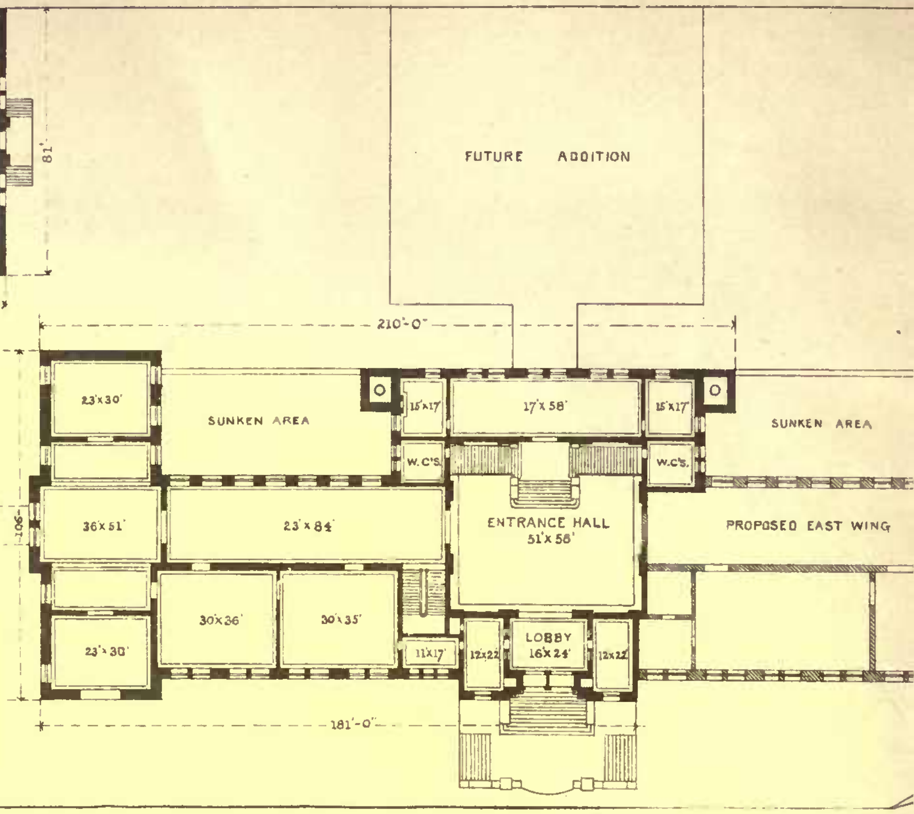
Heliotype Printing Co. Boston

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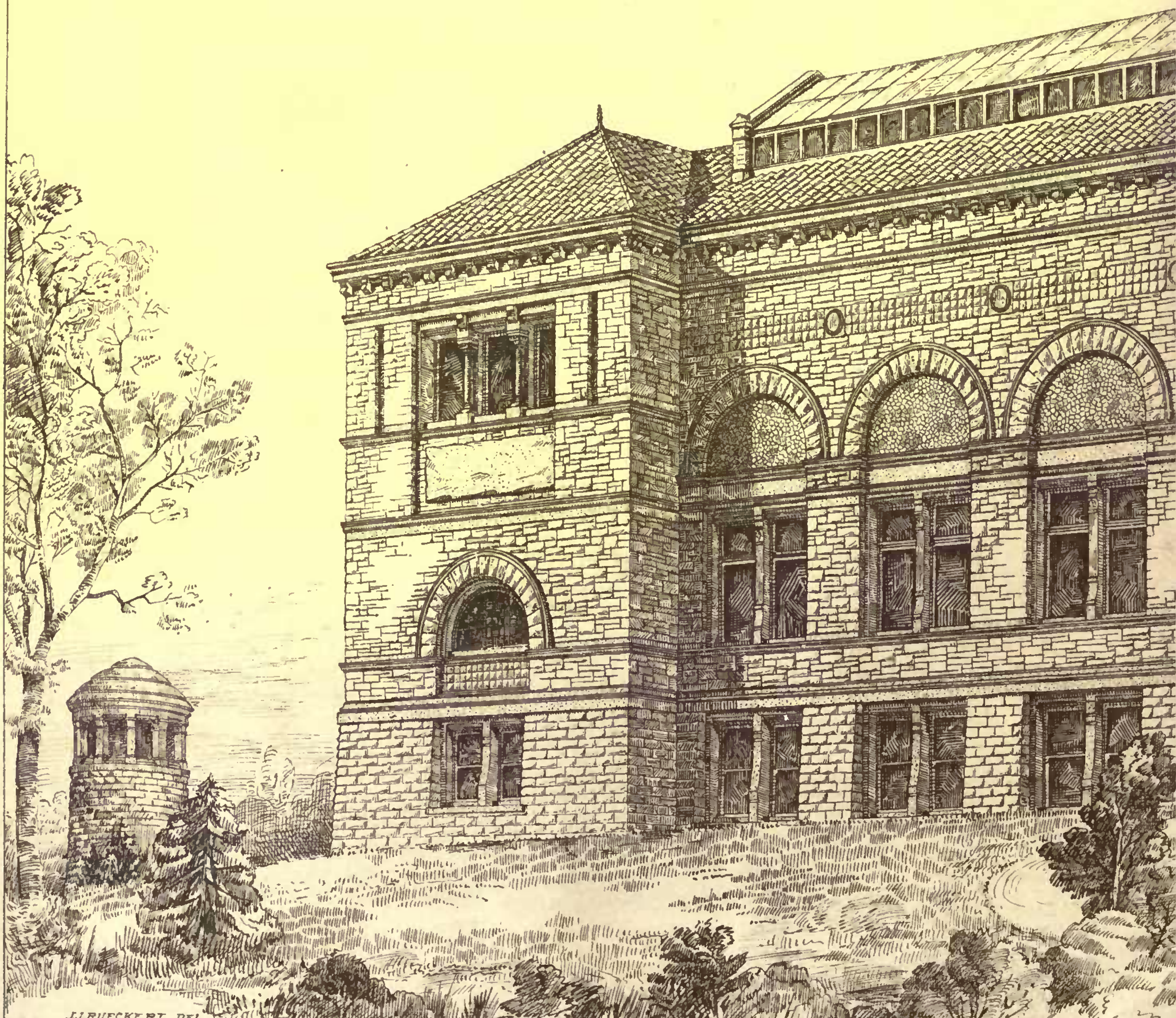


·FIRST·FLOOR·PLAN·
·OF·
·THE·ART·SCHOOL·



·FIRST·FLOOR·PLAN·
·OF·
·CINCINNATI·MUSEUM·

·JAS.W.McLAUGHLIN·
ARCHITECT

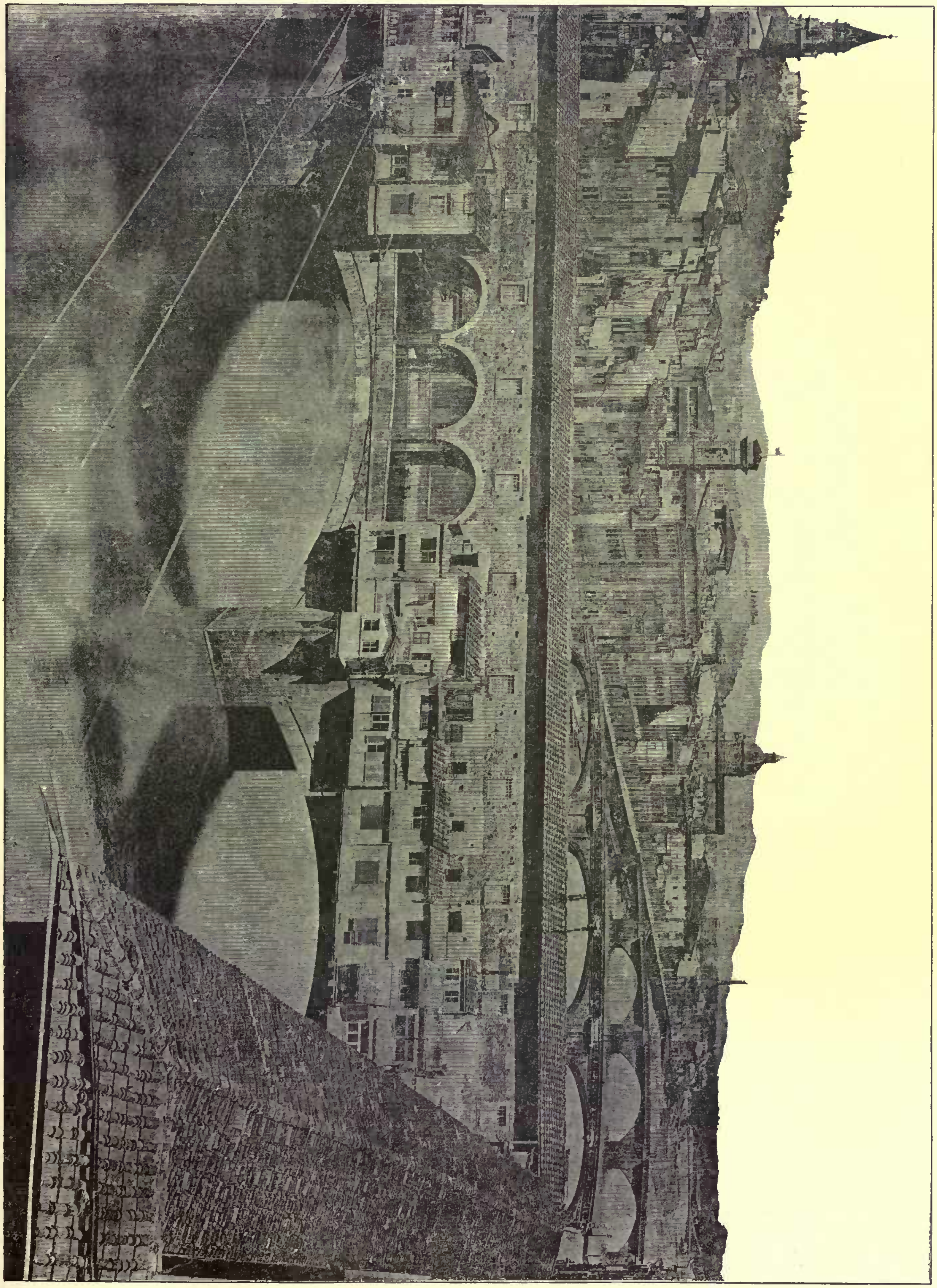


J.J.RUECKERT. DEL.



HELIOTYPE PRINTING CO. BOSTON

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This building, put up by Humphreys, the contractor of the Exhibition buildings generally, having served for the "fisheries," "healtheries" and "inventories," is destined to serve as the Durbar hall in the "colonies" of next year. In the West Quadrant, Maw & Co. exemplified a new and artistic modification of their world-renowned encaustic tiles, making them into little round medallions and various other forms, for insertion by way of ornament into articles of furniture. A cabinet made of American walnut, enriched in this way, produces an exceedingly good effect.

Besides new inventions made since 1862, the date of the last great exhibition in London, Music was a subsidiary subject for this year's demonstration. Thanks to several important loans, including those by the Queen and the Brussels Conservatoire, the Executive Council were enabled to form a remarkably interesting collection of ancient musical instruments, including Stradivarius violins, a sixteenth-century Regel organ, Queen Elizabeth's own virginal, a fine Hitchcock spinet, several harpsichords, Rizzio's guitar, an amati kit, and a mandolin which belonged to Pesaro, once doge of Venice. These rare curios were housed in three typical rooms, fitted up by Mr. Donaldson, one in the Louis Seize style, another of the Tudor epoch with fine Persian carpet of equally ancient date, and the third in the early eighteenth-century style, with panelling, tapestry, mantel pieces and furniture of the several periods.

The Old London Street has become more realistic than ever, owing to its year's weathering, and more especially to the addition, under the direction of Mr. William Bennison, Architect to the Executive Council, of a concrete floor made to represent the old cobble paving, with open, central gutter. Five electric arc-lamps are so arranged as to throw a flood of moonlight into the quaint corners and narrow alleys, while the shops or stores are lighted by incandescent lamps. These stores, re-peopled with artificers of both sexes, clad in costumes of the period, were allotted, so far as possible, so as to afford comparison between ancient and modern processes of manufacture. Next door to a confectioners, where American caramels were produced before the eyes of the public, Jones & Willis's handicraftsmen turned out mediæval ironwork and ecclesiastical furniture. By the side of Dick Wittington's parlor, Elkington & Co. made electro-plated forks and spoons; while over the way Mappin & Webb inserted the knife blades, forged in the South Promenade, into handles with a screw and shellac, so that they are "warranted not to come out." On the upper floor Salviati's art-glass adjoined the paper-staining factory, redolent with size, of Scott & Cuthbertson. Feetham & Co. showed such characteristic old English fireplaces, that one was almost tempted to believe they were the genuine article instead of reproductions. "Atte ye shoppe of Master Thomas John Gawthorp" were to be found artistic memorial brasses; and at the adjoining emporium Gillett & Co.'s hand-made clocks and carillons. This firm lent the two old bells projecting from the tower, reproduced after that of All Hallow's, Staining, with stocks on one side and pillory on the other. These famous bells were first put up in the monastery at Glastonbury in 1335; but at the suppression of religious houses during the Reformation, they were secretly conveyed to Wells Cathedral, remaining there until 1878, when they were taken by the firm in exchange for bells of larger dimension.

Doulton, of Lambeth, showed in the north gallery some fire-clay blocks for surrounding stanchions, to protect them from the effects of a fire, and in the central gallery twelve artistic panels illustrating events in the lives of William Caxton, Benjamin Franklin, James Watt, George Stephenson, Richard Arkwright, Michael Farady, and several eminent musicians. The water pavilion of last year was now made the Austrian Court, where were exhibited most beautiful examples of Bohemian and Viennese ceramic ware, including copies of old masters on porcelain plaques, and a dinner-service made for Prince Rudolph of Austria, with ivory-white ground and dark-blue and gold ornament. Here, too, were exemplified the many adaptations of "bent wood" to various articles of furniture.

Clark & Standfield, civil engineers, sent models of the hydraulic lifts for raising canal-boats bodily, that are now being constructed at Fontinettes, in France, and La Louvière, in Belgium. Powell's mud-lift was shown in action, its object being to receive road slush at the gutter level, and lower it to the sewer for the water to run off, when the residuum can be again raised and removed. The advantage of West's slab system of building in concrete was practically demonstrated, the slabs forming an inside and outside facing to receive the liquid concrete, and thus superseding the use of boards or plates. A model illustrated Homan's method of fire-proof construction, which consists in bedding rolled joists in concrete, thus preserving them from attack by fire. He uses a special concrete, which affords good hold for nails, so that wood fillets are dispensed with, and the floor-boards are laid directly on the concrete, thus leaving no air-space. Charles Wood's silicate cotton, made from blast-furnace slag, was shown in its many applications to building as a non-conductor of sound and heat. Another method of utilizing slag was shown by L. Roth, who makes it into hydraulic cement. A Paris firm sent various articles of construction made of cement, strengthened by an internal skeleton of iron wire. Among the many tiles exhibited must be mentioned those by Robson for a drip-course in walls, those by Halford, made of glass, for insertion in cast-iron frames as floor-lights, and those by Menant, of zinc, with tubular water-tight joints, for roofing. An improved method of slating roofs was shown by W. Middleton, who makes two holes along a horizontal line in the middle of the slate, and cuts the top of the slate in such a manner that the pins clear it. Frankenberg claims to render corrugated-iron roofs "absolutely" water-proof by a coat of his patent "mastic astrictum," which was represented. Exemplifications were given of the many uses of Balmain's luminous paint, including that of a portable lantern, for giving light in an explosive atmosphere.

An exhibitor, whose name was not apparent, left out a tray of wood screws, in which the unscrewed portion is turned of a smaller diameter than the outside of the thread, offering one to whoever would give his opinion on the advantage of the improvement. There is little doubt that the screw is more easily inserted, on account of the shank exerting less friction; but, on the other hand, it will not hold so firmly as the ordinary screw, which is jammed tightly into the timber. A model was shown of Quayle's window-protector, consisting of vertical bars, which rise with the lower sash on its being opened, unless purposely disconnected, thus preventing children from falling out or thieves from entering. In Robinson's carriage-window sash-stop, the window may be put up and down without a strap, and released on merely touching a spring. Laycock's patent-blind roller may be stopped in any position going up or down, and will remain there without requiring a stud or button to hold it at top or bottom, the secret being that the constant-action spring is exactly balanced by the bottom roller, so that the blind stays where it is placed. J. W P.

MURAL PAINTING.—I.



THE glories of mural painting have lately been eclipsed by the predominating popularity of its younger sister, the easel picture. The eclipse has not been total, and, given the proper impetus, its sun may yet shine with more than pristine splendor. True, the pictorial story-telling age is gone, at least for us. The A B C's of history, the quondam all-sufficient biblical narratives are no longer gleaned from temple walls; prosaic type has usurped their functions. Rising generations imbibe more copious draughts from more generous fonts. Didactical painting is no longer the principal, merely an accessory, though not a valueless one. Picture-writing is evidence of savagery. Painting has other spheres, though many deluded painters (and musicians) still cling to the story-telling idea, and try to churn out of poor paint (and sound) with a labor to which the mountain's travail is as naught, ideas that the pen of poet can jot down with a facility that must ever be their despair. From the time that man was man — and that we fain must believe was at least a million years ago — he has had a heart, and it is probable that he will continue to have one, unless the wise men of the earth evolutionize it out of him again, till this world is chilled to its marrow, and for mere warmth's sake drops into the sun. Now, at least, good mother earth is warm. Men live on her and feel. Yes, 'tis the *feeling* that is the fun of it as well as the sorrow. An unemotional entity would be about as sympathetic as the snow-man of the winter-loving urchin.

Art is the high-priest of the emotions, the great humanizer. To humanize the million is one of the problems of the day. Mural painting, above all other kinds, is for the million. Its dignity, its simplicity, its light, airy tones are wonderfully impressive, even to the uncultivated. Its mere accessibility is greatly in its favor; so, too, its intimacy with the structure. Mural painting is no movable exotic, but an actual part of the habitation. Art should be all-embracing. Of course there is an esoteric art, very charming to the elect, just as there is an esoteric literature; but, completely to fulfil its mission, art must be exoteric. What better vehicle for a universal, beneficent art than the wall? As for wall space, actual and potential in this land, the brain reels to think of it. For ages custom has sanctioned the painted wall of temple, capitol and theatre; but what glorious opportunities are offered by the walls of our colossal railroad stations, our public halls, our mammoth hotels and costly restaurants, our vast stores! Paint them, and the people would be brought face to face with art in the daily routine of life, and absorb it as children absorb a foreign language. Instead of the occasional visit of a few to some remote museum of fine arts, or to a fee-exacting exhibition, there would be the effortless, expenseless communion with art at all times. Art, like religion, should be an every-day affair. Museums are oases in a Sahara of bad taste (and blessed be their founders), but they are not enough. Of necessity they are exclusive. We ought to live with art. Beginnings, humble beginnings, have already been made to decorate some of our large structures. Unfortunately these efforts have not been universally successful, owing

rather to lack of practice and good taste than to lack of money. Yet bad taste is not infrequently better than no taste at all, since it may lead to better things. The habit of decoration once acquired, the bad will eventually be replaced by the good. That stupid negative doctrine advanced so persistently and with such puritanical priggishness by some people of so-called "good form," that a room or a house must be bare — "chaste" and "simple," they say — that "beauty must be unadorned," means artistic famine. This negative doctrine, by the way, is germane to the modern Anglo-Saxon tendency to suppress emotion. Hamerton, in a capital chapter ("Unrecognized Untruth": Human Intercourse) remarks, "Overstatement is regarded as a vice, and understatement as a sort of modest virtue, whilst in fact they are both untruthful, exactly in the degree of their departure from perfect accuracy." The latter kind of untruth he calls the "untruthfulness by inadequacy." To establish a "learned balance" between the blank and ornamented spaces is the effort of all good architects and decorators. This quality, the essence of successful ornamentation, is a source of ineffable delight to the beholder.

By mural painting I do not mean geometrical design, merely, or purely conventional ornament, but rather figure-work, combined, perhaps, with conventional ornament, or that sort of design where a free imagination seems to dominate the rule and compass, and which certainly would not be repeated indefinitely without modification. This is a somewhat lame definition — certain things never can be defined — but one, I trust, that will be felt. A repeated pattern or diaper is well enough at times, but alone in an important edifice does not suffice. It may play the part of accessory, but cannot fill the protagonist's rôle. Though there are splendid historical exceptions, it may be said that a geometrical pattern, interlacement or the like, however ingenious, unaided by the figure or other important motive from nature, tends to produce a very irritating mental effect, when, as has just been observed, it covers large spaces in important interiors. It seems to torment the brain instead of refreshing it, appealing to the imagination in a measure, but working it as mathematics work, without soothing it. How sterile, merely for an example, and starved is a theatre without the graceful, eloquent, suggestive forms of the human figure.

There are those who still believe in the oft-cited but false principle that mural figures should be treated only in outlined flat tints. They hold that modelled forms will conflict with the architecture. The proper thing to do is to make the figures, modelled or not, *look well* in their given places. If they discord with the architecture, they will surely not look well. Painters of experience would never try to make their figures "come out from the wall" — not such an easy thing, by the way, to do if they use colors and mediums suited to the work. And if by chance the figures should come a little too far forward, though it is better that they should not, would it be a very heinous offence? Would it be half so heinous as the frequent current practice of shading the ground-tone of a wall, light above and dark below, or vice-versa, so that the wall appears to topple? This question of relief will be handled in a subsequent article on the technics of mural painting. After a few prefatory and somewhat erratic observations, I intend to describe, technically, some of the principal methods of wall-painting, and conclude with a few observations on the personal qualifications of the painter.

It cannot be denied there are conditions that antagonize as well as those that favor the development of mural painting in this country. The fluctuation of wealth is against it. Fathers make a fortune; their sons dissipate it. The equal distribution of the parental property is not conducive to the maintenance of the family mansion. The denial of the rights of primogeniture means the non-erection of those stupendous monuments of family pride, the glory of their own and succeeding ages, with which every traveller is familiar. There is, moreover, a general feeling that socially we are living in a transitional age. No one dares to discount the future. Mighty agencies are at work that render the prolonged tenure of property a matter of doubt. Formerly a patrician built for eternity; to-day every man is a patrician and builds for his lifetime. The concentration of art in the palaces of a lordly few is giving place to its diffusion over the whole land. In the palmiest days of Grecian art the private houses were simple, the public places resplendent. This is somewhat consoling. Doubtless there will always be exceptional houses dominating their neighbors, at least till the millenium sets in. On the other hand the average house promises to be luxurious, vastly more so than the average Grecian house in Pericles's time. There are opportunities for artistic work of a high order, even in comparatively modest houses. If people would only learn to husband their resources, to concentrate it on given points, and not to fritter it away in useless decoration from attic to cellar: a little more cream and a great deal less skim-milk. It is the cream that stamps a house, proclaiming the taste of the owner. How many a quiet façade, or plain-toned wall has been dignified by a delicately-carved moulding or a sweetly-painted frieze? People always economize at the wrong moment, forgetting that the few last touches are the most telling ones. Here let it be observed parenthetically that though artists have always been blamed for their unbusinesslike qualities, *per contra*, in matters of taste there is no one more unbusinesslike than the business man. So skilfully does he scheme at times to get the worst thing possible. Bad taste is about as expensive as good taste, though the latter in the end is a more profitable investment. What fruitful property the paintings and frescoes of the fifteenth and sixteenth centuries have proved to be! Hear what Morelli says of the Sistine Madonna: "It cost Saxony about two hundred and twenty thousand francs. What price would it now fetch, when a Murillo has been thought worth seven hundred and thirty thousand francs! None but a Rothschild could afford to buy it. If the picture were still standing in its little church of S. Sisto at Piacenza, not only would that town be more talked of and more visited than it is, but that picture alone would bring the inhabitants more gain than all they possess besides."[1] A first-class Raphael in Broadway would probably give better dividends than the most favored railroad stock. This is an extreme case; yet one may guess that the bar-room Bouguereau has paid handsomely. Though I cannot speak authoritatively, I am inclined to think that a house with a little tasteful decoration would let better than a house with a great deal of offensive decoration, other things being equal. Again, when a building is condemned, the good things are saved.

That mammon of unrighteousness, the speculative builder, is the avowed enemy of good decoration (and of mankind). Judging from the cracked, peeling, spotted and generally demoralized walls, ceilings and stucco-work to be found in nine houses out of ten, one is tempted to dub all plasterers and builders — I don't dare to add architects — mammons of unrighteousness. Seriously, our plaster-work is disheartening, totally unfit to receive mural paintings of value. Its amelioration is well worth the earnest attention of all conscientious architects. General shabbiness ought not to supervene after a few years of use. Even paint, if properly laid on a firm ground, and in the right place, should hold for generations, to judge from the paintings that have come down to us from antiquity. Durability is a noble quality, yet held apparently in light esteem. Perishable substitutes do duty for stone, terra-cotta and the hard woods. Inferior plaster is hastily spread over flimsy, inflammable furrings, and as a consequence threatening fissures are speedily developed. This lack of durability is often disguised by upholsterers' work that soon deteriorates. How inherent is the taste for upholstery. How people love it. Verily, the moth has its functions. Akin to the taste for upholstery is the application of incongruous and inappropriate materials to alien surfaces. It is a pleasure to feel that a design is made for the place, congenital with it; not an applied, interrupted design that might as well have veneered anything else (interrupted designs are rarely satisfactory). Call to mind the patch-work ceilings in wall-paper scraps (how can men be so viciously ingenious); the inappropriate bits of plush, often in combination with durable metals, employed ubiquitously, sometimes framing, sometimes framed; the machine-stamped designs to be cut to suit the place — ready-made ornament "on draught" as it were. Some of this ornament may be good, even first-rate, but sole proprietorship enhances any art-product. Vulgarize a thing and it loses its charm. Do we feel happier when a coat identical with our own confronts us? This feeling may be very unphilanthropic, but it is not inartistic. If expense precludes the use of elaborate mural paintings, certainly it cannot of carefully-chosen flat tints, relieved here and there, if necessary, by a few appropriate lines. Wall-papers are not objectionable if used with discretion. They are very appropriate to cottages and to informal or temporary structures. Still, papers are substitutes for something better, and those who can afford it indulge in paintings, tapestries, wood-work, or other rich and durable materials.

The day for ecclesiastical decoration has by no means passed away. There is less votive piety than there was in the palmy days of "*buon fresco*," and what remains expresses itself in glass rather than in pigment, though the stained window is but a phase of mural painting. The taste for memorial windows is genuine, and likely to wax stronger. Their rich, transparent tones are entrancing, their splendor exalting. Add to this the sanctity of ages, and an ineffable mystery engendered partly by the radiation of the blending tones, partly by the maze of leaded lines, and we have the *raison d'être* of a beautiful and legitimate form of church decoration. The blond, I might almost say heavenly tones of fresco, if well lighted, are extremely happy in churches. In a dome, for instance, how ærial they are. Care must be taken to avoid a clash with the windows; but paintings clash less with stained glass than one would suppose, so totally different are they in quality of color, and so overpowering is that of the glass. In churches dimly lighted by "storied windows richly dight," paintings are superfluous, for the reason that they are practically invisible. Clear glass is always more favorable to them; yet the combination is frequently desirable. Then the stained glass should neither be so clear, even, or thin, as to shed colored rays on the walls, nor so dark as to obfuscate the decorations. Painter and glazier can rarely work together in a church, seeing that its decoration is slowly accumulated. Where they can, mutual enhancement of their work should be the result. Mosaics are the most suitable accompaniment to colored glass, but expense precludes their general adoption.

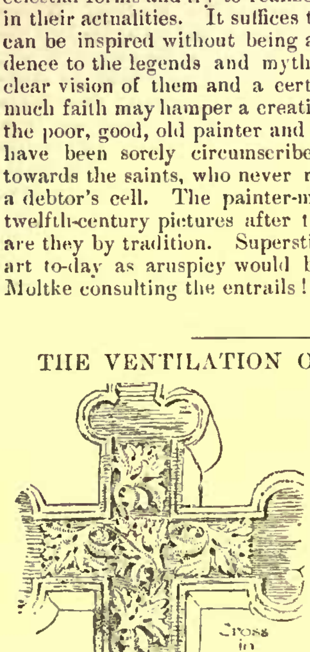
Not long since the interior of the average Protestant church was but little better than a barn, the natural result of Puritanism. Every day we are emancipating ourselves from the outward expression — austere and hungry — of that sturdy faith. Worshippers crave sympathy, geniality, less bare wall, more emotion, and — art. At least, so I heard some orthodoxly-minded deacons observe one day, while working unseen in a dimly-lighted dome. A church, to be popular, must be attractive; the preacher must have a becoming back-ground — so, at least, the deacons said. Under whatever forms religion may manifest itself, whatever may be the tenets of the day

[1] "*Italian Masters in German Galleries*": *Giovanni Morelli.*

and place, or however modified by modern ideas, in the broadest sense of the word man will always be religious. These broader, more human, less encumbered beliefs might well seek expression on the wall. They have not yet been treated. Even the old ideas can be repeated *ad infinitum* without wearying, if they be rendered with modern feeling. That love of ecclesiastical grotesqueness, the offspring of mediæval insufficiency, is very stupid. Some think that a painter must have the faith of an Angelico to limn an angel. Not a bit of it. The faithless Perugino painted exquisite angels; Raphael, the divine Raphael, was a courtier of pagan Leo the Tenth. To believe in your saints and angels artistically is the requisite, to fancy celestial forms and try to realize them. It is not necessary to believe in their actualities. It suffices to be inspired by the subject, and one can be inspired without being a bigot. The poet does not give credence to the legends and myths he celebrates in verse. He has a clear vision of them and a certain temporary fictitious belief. Too much faith may hamper a creative mind. Even in his orthodox days, the poor, good, old painter and author, Cennino Cennini [1437] must have been sorely circumscribed by his very conciliatory attitude towards the saints, who never rescued him from a wretched death in a debtor's cell. The painter-monks of Mt. Athos are still painting twelfth-century pictures after the recipe of Panselinos, so enslaved are they by tradition. Superstition would be as great a drawback to art to-day as aruspicy would be to military science. Fancy a Von Moltke consulting the entrails!

FREDERIC CROWNINSHIELD.

THE VENTILATION OF PRIVATE DWELLINGS.[1]



THE atmosphere, as most persons are aware, is mainly composed of two gases, nitrogen and oxygen. The former, constituting nearly four-fifths of the entire body of the air, serves as a medium in which the other ingredients are diluted. Of the oxygen there is rather less than twenty-one per cent, and its presence is essential to the support of animal life. The percentage of it which we consume in breathing varies according to circumstances, such as age, sex, time of day or night, whether we are sleeping or waking, and whether or not we have just partaken of a meal. The smallest amount is probably four per cent, while the largest has been stated at more than twelve per cent. This appears to be an exaggeration, because, according to a certain law of affinity between gases, we cannot extract much more than ten per cent of oxygen from the atmosphere, however often we inhale it. I do not think it safe to allow less than ten per cent for our average consumption, because we must remember that at night a certain proportion of oxygen is abstracted from the air by vegetation. We see from this the danger of attempting to breathe the same air twice over.

Besides other gases of various kinds in minute quantities, common air contains carbonic acid gas, or anhydride of carbon, to the amount of about four parts in ten thousand. In exchange for the pure oxygen which we inhale, we return to the air nearly eight per cent of carbonic acid, and a variable amount of watery vapor impregnated with certain organic impurities. This vapor does not mix uniformly with the air, but has a tendency to hang about in clouds, similar to those which become visible in a partial vacuum. I calculate that, altogether, we evolve about eleven cubic feet of vitiated air per head every hour, including what is thrown off by the skin. Carbonic acid gas has been spoken of as poisonous, but this appears to be a mistake. It has the power, when in sufficient quantity, of producing suffocation; but the most poisonous ingredient of exhaled air is said to be the organic impurities discharged.

It will be seen that we require eleven cubic feet of pure air per head every hour for breathing purposes, and, if we could depend upon its purity, this amount would suffice. It must not be imagined, however, that if we introduce this amount into a room it will be sufficient, because the impure air which we throw off has a tendency to diffuse itself, thus polluting a large proportion of the air which we require for breathing purposes.

In a room containing a given number of persons, a certain amount of polluted air must be withdrawn per hour, and, of course, an equal amount of pure air must be introduced to replace it. This amount has been variously stated by different authorities. Some early writers on ventilation have given it at from two to four cubic feet per minute, or from one hundred and twenty to two hundred and forty per hour. Péclet states it at two hundred and fifty, Hood and Morin at three hundred, Dr. Reed at six hundred, and Capt. Douglas Galton arrives by experiment at twelve hundred, and by calculation at three thousand. This calculation is based upon the assumption that the impure air diffuses itself rapidly, at a uniform rate, throughout the entire atmosphere of a room. The assumption is nearly true as regards the carbonic acid, but not as regards the organic impurities. Adopting this assumption, however, we find that although a large volume of air requires a longer time to reach a given standard of impurity than a smaller one, yet when that standard is reached, the supply of fresh air necessary to prevent higher contamination is the same in a small as in a large room. We should then have to make up our minds as to what degree of partial purity would satisfy us, and regulate the ventilation accordingly. Ventilation would then consist, as it often does, in merely diluting impurities which can never be completely expelled. There is no doubt that the organic impurities thrown off by the skin and lungs are apt to linger in the corners of a room, and can only be driven away by strong currents of fresh air introduced by opening windows and doors for a certain period every day. This is the "airing" to which every inhabited room should be subjected, and is quite distinct from regular ventilation.

The hypothesis that exhaled air diffuses itself uniformly cannot be sustained, because it has a tendency to ascend, through being lighter than the air at ordinary temperatures. It is lighter because it is rarefied by heat and saturated with vapor. I find that a cubic foot of exhaled air weighs just four hundred and ninety-three grains immediately after it is expelled from the lungs. It is soon partially chilled, however, and arrives at the same specific gravity as that of common air at about 80° Fahrenheit, in which temperature it has no tendency to rise, but hangs about in clouds, and is liable to be inhaled over again. This is one reason why heated rooms are unhealthy, another being that, as the whole atmosphere is rarified, the same quantity of oxygen cannot be inhaled at a breath as in colder temperatures. Most persons will find 65° a pleasant as well as healthy temperature, and I should never recommend anything higher than 75°, except in Turkish baths.

If we suppose the fresh air to be introduced from the lower part of a room, while the foul air finds an exit at the ceiling level, we shall see that it might be possible to keep the supply practically pure. To my mind the problem of perfect ventilation depends upon two conditions: the rate at which the foul air ascends, and the rate at which it is diffused. If the velocity of diffusion were equal to the velocity of ascent, the air below the level of our nostrils would never be contaminated by our breath, which would be constantly replaced by perfectly pure air. All we should have to do, then, would be to provide for the egress of as much air as could become contaminated in the time occupied by each exhalation in reaching the outlet. The higher the outlet, the greater would have to be the amount of overflow, and, by consequence, the greater the amount of supply. The velocity of ascent would be retarded as the foul air approached, by admixture, an equal density with the surrounding air; it would, in fact, vary directly as the square root of the difference of density. The velocity of diffusion would vary inversely as the square root of its density, but would be nearly uniform.

From calculations, too long to be quoted here, I arrive at the conclusion that when an outlet is not more than twelve feet from the floor, the foul air will reach it in about ten seconds, during which time it will have been diffused in about forty-three times its volume. This gives the amount of outflow at about four hundred and seventy-three cubic feet for each individual — let us say an average of five hundred feet — and this should be the allowance in ordinary dwellings. In the case of artificial lights, separate outlet tubes should be provided for gas brackets or pendants, or for any kind of light which is fixed. The products of combustion from candles which are carried about are too trifling to merit consideration; but it may be useful to remember that two candles are said to consume as much oxygen as one grown person.

As regards the capacity of outlet tubes, that must, of course, depend upon the velocity of the outflow, which is governed by the difference of temperature between the foul air and the surrounding atmosphere, and in fact varies directly as the square root of that difference. It is greater according to the length of the extraction flue, provided that the foul air is not chilled in its passage. With an average difference of three degrees in a tube or flue ten feet long, the velocity will be about five thousand feet per hour, or an outlet of one foot superficial capacity will extract sufficient for ten persons. An outlet four and one-half inches by three inches, or of about fourteen square inches' capacity, would, under these circumstances, suffice for one person, and this is the allowance which should be made. Of course, if we have any artificial means of extraction, much less will do; but such means are generally too expensive to be adopted in private dwellings. Natural ventilation — that in which we depend for our extracting power upon the difference between the specific gravities of warm and cold air — is that on which we must chiefly rely. It is well to remember that foul air is heavier than pure air when both are at the same temperature, as we shall thus understand the danger of allowing the former to become chilled.

Probably a bedroom is the most difficult apartment to ventilate satisfactorily during the night. In an average room let us consider what happens. The air of the room is warmer than that outside, and consequently it ascends the chimney in a central column, while there is a certain amount of down-draught — usually very little — in the sides and angles of the flue. The air abstracted from the room is chiefly supplied through the crevices of the door, and as it comes from the interior of the house, it is therefore very far from being pure. Unless the staircase windows are kept open, the house will be largely supplied with air from the lower part, that is, through the

[1] A paper by Mr. B. H. Blagrove, read before the Architectural Association, and published in the *Building News*.

crevices of external doors. Such air will be impregnated with impurities, some of which will be drawn from the sewer gratings in the road, through which authorities persist in allowing our streets to be poisoned. This air, such as it is, is chiefly available for ventilating our bedrooms, and it partially purifies the air up to the level of the fireplace opening, scarcely disturbing the air above it. Woe betide the sleeper if his bed be above this level, for he will pass the night in a stratum of air which will continually grow more and more impure. Architects generally keep down the height of a fireplace opening to within a reasonable proportion of its width, and, as bedroom fireplaces are never very wide, we have in most houses some wretched little pigeon-holes to do duty as ventilators. If the sleeper's condition be generally bad in a room containing a fireplace, what must it be in a room which has none? We may safely assume that if it were not for cracks and crevices in imperfectly constructed windows and doors, many persons would be suffocated, and this is one argument in favor of "jerry" building.

There should be outlets in or near the ceiling. If you put your outlet at any level below the ceiling, you will have a constant stratum of foul air down to that level, and it will be liable to pollute the remaining air of the room. There may be any number of outlets, which may take the form of ornamental perforations, but they should all communicate by outlet tubes with one flue carried up the wall. If you have two or more extraction-flues to the same room, there is always the danger of a down-draught being established in one of them, through differences of atmospheric pressure. In order to maintain a constant up-current in an extraction-flue, the flue must be carried down below the level where the foul air enters it, to some point where cold air can be admitted. This can easily be done in external walls by means of gratings. In internal walls the flues may be carried down to a cellar in the basement, into which air can be admitted through tubes or gratings. We should then consider that a column of air, equal in height to the entire atmosphere, is pressing upon the opening at the lower end of the flue, while the column of the same height, minus the height of the foul air in the flue, is pressing upon the top, the result being an up-current.

I have known extraction-flues closed at the top and provided with side gratings only. This I conceive to be a mistake, as the air blowing in through this grating may acquire a downward direction, checking the up-flow of foul air. There should always be a vertical opening; for there is no apparent reason why foul air should behave differently from smoke, and its upward passage may be assisted by means of louvred gratings let into the sides of a stack. Boyle's or other extractors are undoubtedly useful. Their operation depends upon the principle that a current of air blowing across an opening causes a partial vacuum, which creates an up-current, as exemplified in the well-known apparatus for diffusing scent by means of two glass tubes; but of course no dependence can be placed upon these extractors in calm weather.

There is always a danger of foul air being retarded in its passage to an extraction-flue by the pressure of cold air already there. The difficulty has sometimes been obviated by conveying all the outlet tubes into one large foul-air chamber, say, in the roof. Thence the foul air is carried into the extraction-flue, and it is found that a steady outflow is better maintained through a tube, when it is backed up, so to speak, by the pressure of this large body of foul air behind it.

There are artificial aids to extraction which may be invoked in ordinary dwellings, the most important ones being heat. As I have before hinted, extraction by fan engines is too expensive to be adopted for small buildings, but I would suggest that it might be possible to design a terrace of houses with two towers — one for extraction and one for supply—which might be made pleasing architectural features. Sometimes extraction-flues have been carried up inside a large kitchen flue. When the kitchen is placed at the top of the house, as recommended by Dr. Richardson in his "*Hygeia*," the heat of the kitchen fire can be utilized for warming the upper extremities of the extraction-flues, and increasing the current in them. An outlet-tube should never be conveyed into a smoke-flue, partly on account of the danger of the smoke being occasionally driven back into the room, but chiefly because the outlet-tubes may become partially choked with soot.

If the smoke-flues were carried down to a ventilation cellar in the basement, the up-current in them would be greatly increased, to the probable prevention of what is termed "smoky chimneys." The current could always be reduced, if necessary, by partially closing the register. The chimney could be swept from above with a sweep's brush let down by a rope, and all the soot would pass into the cellar instead of into the room. I am told that this plan is adopted in Berlin.

With regard to the introduction of fresh air into houses, this forms perhaps the most difficult part of our subject, on account of the dangers arising from draughts when no special means are adopted for warming the inflow. To insure the greatest possible purity of supply, the air should not be admitted very near the ground; therefore, for ground-floor and basement rooms it is advisable to provide inlet-flues. Any tubes or gratings used for this purpose ought to be of galvanized-iron or some material not liable to rust, because, in the process of rusting, oxygen is absorbed from the air.

We ought to consider the true nature of what is called draught in deciding how fresh air is to be introduced into a room. So long as the air is colder than the surface of our bodies, it will absorb heat from them, and while the air in contact with our bodies is continually being changed, it continually presents fresh capacity for absorbing heat. This is why air at, say, 60°, in motion, may really feel colder to us than air at 40° when at rest. If, therefore, there is to be a certain amount of motion set up in the air of a room, the more that motion is distributed the less it will be felt. Hence, if we place the outlets in the highest part of a room, we ought to place our inlets in the lowest part. Air will rush into a warmer medium with great velocity, and if we provide the same capacity for inlet as for outlet flues, we may be quite certain of being upon the safe side.

The next thing is to provide for distributing the inlets inside our rooms. If the air is admitted from a flue or external grating, it may be conveyed by a pipe or channel under the floor to the opposite side of the room, where it can be carried behind the skirting. Where doors occur, the pipes may pass beneath them, and up again into the skirting. Holes should be formed in this pipe for the escape of air, and at the point where the pipe is first carried up behind the skirting, and where the air-pressure is consequently greatest; these holes may be nine inches or six inches apart, and of about one inch capacity, and their interspacing should rapidly diminish to two inches or three inches, as they pass along the adjacent sides of the room. The object of this is, of course, to equalize the velocity of the inflow. Ornamental perforations should be placed in the skirting, and filled in with perforated zinc. By these means the inflow is subdivided into minute streams, and mingles with the air of the room, becoming warmed by it, and thus producing no violent change of temperature. Capt. Douglas Galton has stated that the velocity of inflow into a room should not exceed one foot, or at most two feet per second, to avoid draught. I find it is easy to obtain inlet areas amounting to eighty square inches in capacity, in the skirting of a room twelve feet square; and if two thousand cubic feet per hour, which is enough for four persons, be introduced, the inflowing velocity will not exceed three thousand five hundred feet per hour, or less than one foot per second — a limit which I think safe. Some means ought to be provided for controlling the supply, which is apt to rush in with too great a velocity when there is much difference between the external and internal temperatures. This may be done by means of a choke-valve in the main inlet-pipe, or by adjustable louvrès outside. By either of these means the inflow could be partially or entirely checked at will.

There are some other methods of introducing fresh air, to which I should like to call attention. We are all tolerably familiar with the simple device of putting a bead of extra depth to a window-sill, which enables the lower sash to be raised so as to admit the air only between the meeting-rails. An ingenious device has recently been patented for Mr. W. Pope, for converting the cased frame of a sash into a ventilation-flue. The air is admitted between a set of louvres placed in the lower part of the pulley-style outside, and it enters the room through another set of louvres in the upper part on the inside. The outer louvres are so arranged that they can be partly or entirely closed by turning a small knob inside. Mr. Pope calls this "pulley-stile ventilation," and it is obvious that it could be introduced into any house without much difficulty or expense.

A method of so-called ventilation by diffusion has been mentioned. It consists in fixing fine gauze in an opening, so that a constant interchange between the external and internal air is carried on, it is said, without perceptible draught. If a proper outlet is provided in a room containing a fireplace, it will be found that a considerable amount of cold air will rush down the chimney; and if there is any other means of supply, it may be advisable to close the register when no fire is lighted. Otherwise I would suggest the use of a species of chimney-board, which would be, in fact, a frame filled in with fine wire gauze or perforated zinc. By this means the inflow would be distributed and its velocity diminished. When a fire is burning, a warmed supply may be obtained by converting the jambs of a chimneypiece into a species of Tobin tubes.

I do not regard the Tobin system as thoroughly satisfactory. It appears to me that by directing the current of fresh air towards the ceiling, whence it is afterwards diffused, the inflow is at once mixed with the foulest air in the room, which it chills, condenses and brings down with it. If the inflow does not maintain its upward direction, an unpleasant draught is felt by those who happen to sit near the ventilator. This is the case with hopper-ventilators, or with top lights hinged to casement transoms, even when furnished with side gussets. I have seen hopper-ventilators very artistically treated by having pictures or ornamental mirrors placed in front of them, and tilted forward at the required angle. This mode of decoration is applied to the Sheringham ventilator, which can be partly or entirely closed at will. When the supply is warmed, such means of inlet are satisfactory enough, and might be made available for ventilating rooms from halls or corridors, where the air is tolerably pure, especially when the products of combustion from artificial lights are carried off by special tubes, as was done in the Sanitary House at the Health Exhibition.

The foregoing appear to me to be the principal means of ventilation at our disposal in private dwellings, where no special heating-apparatus is provided. Where that is the case, the whole problem of domestic ventilation changes its complexion; for it can then be conducted upon principles which are also applicable to public buildings.

A COMPETITION FOR A $5,000 HOUSE.

PROBABLY the greatest number of clients that come to an architect during his career are men, or women, who have just $5,000 that they can afford to spend on a dwelling-house, and want to secure with this sum at least $10,000 worth of comfort, eccentricities and "modern conveniences." The problem is an ever-interesting one, not the less so because it calls for so much ingenuity in preserving in the executed work the pet ideas of the client or the happiest thought of the architect, in spite of the dictum of a unanimous band of builders who declare that at least $3,000 worth of labor and material must be pared off before it is possible for the client to sign a contract. For such a client, having just these shadowy ideas of possibilities, and having exactly this sum of money at his command, we propose to hold a competition, and we suppose his instructions are as follows:

The site is a perfectly barren and exposed country hillside, while the only agreeable outlook lies to the northeast. The client, a novelist, works at home and has a family of children who are a questionable assistance in his working hours. The children, the novelist and the outlook are the only special elements to be accounted with. Everything else is as usual — heating, lighting, ventilation, water, drainage, plumbing (hot and cold water, bath-room and two water-closets), closets of all kinds, nurseries, chambers for a family of eight, all told, and the usual living and working-rooms — all to be provided for $5,000, exclusive of the architect's commission.

Required: Two plans, a perspective view, one elevation not shown in the perspective, and details of constructive and ornamental work, drawn to scales, which must be indicated graphically on the drawing, which is to be made in ink on a "double-elephant" sheet; each drawing to be signed with a verbal motto, the author's name being enclosed under seal.

Drawings must be received at the office of the *American Architect* on or before Saturday, February 27, 1886.

For the three designs adjudged of highest merit by a jury of three architects, we will pay $50 each, the prize-drawings, as in previous competitions, remaining our property.

We add an *important and unusual* condition, however. Each design must be accompanied by a bill of quantities, prepared on a "*Handy Estimate Blank,*" procurable from David Williams, 83 Reade Street, New York, at an expense of 25 cents, in the use of which the same publisher's "*Practical Estimator*" would be found a useful instructor.

Our reason for making this requirement is, that we propose to have a competent Boston builder prepare an estimate upon each design, so that the series will have a distinct comparative value. The jury will, however, be allowed to take into consideration in awarding the prizes, the prices obtaining in the market most familiar to the designer, and he would do well to obtain an estimate from a local builder before sending his drawing to us.

To prevent any future misapprehension, we will say that it seems not impossible that a series of designs thus reduced to a common measure, might be found worthy of re-publication in book-form, and should such prove to be the case, we should hope to find it possible to treat with the authors of the most desirable designs.

COMMUNICATIONS

HOFFMANN OR CIRCULAR BRICK-KILNS.

CHICAGO, ILL., December 21, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you kindly answer us by letter the following questions: 1. Is any circular Hoffmann brick-kiln in operation in this country, and if so, where? 2. Is it more economical to make brick by means of the Hoffmann kiln than by the ordinary kiln? 3. Are bricks made in the Hoffmann kiln better? This refers to common bricks. 4. Which, in your opinion, is the best machine for making common bricks? 5. Which is the best work written on brick-making? In answering these questions, your will greatly oblige,

Yours respectfully, BAUER & HILL, Architects.

[WE refer the first four questions to our readers, particularly to those who are themselves engaged in brick-making. To the last, we will reply that "*Bricks and Terra-Cotta,*" by Charles T. Davis, published by H. C. Baird & Co., Philadelphia, probably contains the latest information on brick-making. — EDS. AMERICAN ARCHITECT.]

THE USE OR ABUSE OF PUBLISHED PLANS.

BOSTON, MASS., December 23, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — As the communication, published in your valuable paper of the date of November 14, under the heading of "Payment for the Use of Published Plans," does not seem of sufficient interest to others to call forth any answer, will the editors of the *American Architect* kindly assist me with their opinion, and oblige,

Yours very truly, C.

[WE imagine that no one has expressed any opinion, on the matter simply because every one felt, as we did, that our correspondent had fulfilled all that professional ethics required of him. As to the broad question of the use or abuse of published designs, our opinion, since we are in a manner interested parties, may not be worth much. A published design is probably more often copied in execution than is a building already erected, but we do not believe that either is ever copied without embodying those slight variations which would absolutely prevent the designer's recovering damages in the courts. We believe that designs are offered for publication — apart from the possible business aspect of the matter as so much advertisement — because architects feel the benefit they receive in studying the work of their fellows, and know that if architects did not contribute drawings for publication, there would be no architectural journals. Most architects are, we believe, indifferent whether their designs are copied or not; they have served their purposes, they have got their pay, and they have no idea of stamping themselves creatures of one idea by secluding their designs so that they may be used again without variation. It seems to us that such secretiveness smacks a little of what the doctors consider quackery, when one of their fraternity conceals the method employed in effecting his cures. There is one form of copying, however, which is thoroughly disreputable, the publishing in a private advertising catalogue issued by an architect the designs of other men signed by his name. We have known but two cases of this kind, the most recent one being that of a Washington architect, who transferred from our own pages the design of a Boston firm, taking shrewd care, however, to make just those slight alterations which would protect him in event of a lawsuit. — EDS. AMERICAN ARCHITECT.]

A WORD FOR OUR PHOTO-CAUSTIC PRINTS.

MINNEAPOLIS, MINN., December 31, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — You ask for an expression of opinion as to the photo-caustic plates which you have been issuing. My voice shall most cordially go to their indorsement. While they have not the delicacy of texture or the sharpness of detail that go to make the beauty of a "gelatine print," yet they are so far superior to the average pen-drawing, or, in fact, the best of pen-drawings, in point of detail, that I think they would be greatly missed if they were dropped out of the journal. This would be so in my case, and I know of a number of others who feel as I do. I trust that you will take the silence of those who have not "objurgated" you, as a tacit indorsement of the aforesaid much-abused pictures. You know when people have a fancied grievance they make a great outcry; and when they are satisfied, they do not take the trouble to say so, but let it be taken for granted by reason of their silence. I, for one, have looked upon the prints in question as a free contribution on the part of the publishers, and have, consequently, been disposed to look upon the demerits of them with the same leniency with which one is supposed to look at the teeth of the time-honored free equine. Viewed in this light, which certainly seems the proper one, I see no reason for any fault-finding; but if they (the fault-finders) will not have these, let them supply their place with artistic drawings of such a degree of excellence that every one will be glad of the change. I fancy the ones who find fault are the ones least able to fill the gap in this manner. Wishing you a happy New Year, and all success, I remain

Yours respectfully, R.

"ACCORDING TO THE TRUE INTENT AND MEANING."

PHILADELPHIA, PA., December 29, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs — You will oblige a subscriber by answering this question: A certain water-closet has been specified with all necessary supply and waste-pipes and traps. The iron cistern or tank has not been mentioned in the specification, but this closet is never used unless it has its supply from a cistern. Please answer if the plumber can be made to furnish the same to complete his work.

Truly yours, SUBSCRIBER.

[You can unquestionably require your plumber to put in the tank without extra charge, if the matter is to be decided by customary usage; though if it should become a matter for the courts, it would probably turn on the actual wording of your contract and specification. — EDS. AMERICAN ARCHITECT.]

ANOTHER PHASE OF THE COMPETITION EVIL.

NEW YORK, December 21, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Can you let me know how to obtain a set of drawings which I sent in competition for the Savannah Jail Competition of September 1, and then deferred until October 1? Have not received answer to letter sent recently to Chairman of Board of County Commissioners, nor even received acknowledgment of receipt of plans. If you would kindly give me advice it would be most gratefully regarded a great favor. Very truly yours, "PIS ALLER."

[PERHAPS sending to the Chairman of the Committee a marked copy of this issue, containing as it does the expression of our belief that you have been treated with needless shabbiness, may produce the effect you desire. — EDS. AMERICAN ARCHITECT.]

TELEGRAPH MAINTENANCE IN BRAZIL. — Telegraph building in Brazil is a very troublesome business. The wires corrode very rapidly, and the luxurious vegetation requires constant pruning to be kept from growing so as to interfere. Violent storms often prostrate the lines. Birds build their nests on the top of the poles and ants on their sides, while skunks and armadilloes undermine them and cause their sudden fall. The ants' nests have to be chopped of with axes when old and hard. Wasps build their nests in the bell-shaped porcelain insulators, apes meddle with the wires and the enormous swarms of birds flying by night often wreck or tangle them. More mischievous than any of these is a huge spider that weaves its web between the wires and interferes with the electric currents. — *Boston Transcript.*

NOTES AND CLIPPINGS

The Damage caused in Andalusia by the Earthquakes. — The Commission appointed by the Spanish Government to investigate the great Andalusian earthquakes last Christmas, report that over 17,000 buildings were injured in Granada and Malaga, of which 4,400 were ruined; 745 persons were killed, and 1,485 wounded.

Ancient Editors of Vitruvius. — Hiram Sibley has presented to the Reynolds Library at Rochester eight folios bound in vellum. The collection comprises three distinct works. The first is Merino's edition of "Vitruvius de Architectura" in four volumes. The original work is the oldest treatise on architecture in existence. The present edition was published at Rome in 1836. The text is in Latin. The second work of the collection is Rhigetti's "Descrizione del Campidoglio," in two volumes, published at Rome in 1833-36. It consists of a description of the Capitol at Rome. The text of this work is Italian, as is also that of the third number of the collection, Valentini's "La Patriarcale Basilica Varicana," which describes St. Peter's Church. This work consists of two volumes, and was published at Rome in 1845-55. The eight volumes are all magnificently illustrated with steel engravings. — *N. Y. Evening Post.*

The Re-discovered London Statues. — Three stone statues, recently removed from the cellars under the Law Courts on the east side of Guildhall-yard in London, have been the object of much curiosity. The statues were at first supposed to represent Charles I., his Queen, and Edward VI., but a more careful examination shows that the female figure represents Queen Elizabeth. They were executed in stone by one W. Stone, as appears by his name cut upon the plinth, and were originally placed in three niches in the front of Guildhall Chapel, which formerly stood where the Law Courts now stand in Guildhall-yard. Upon the demolition of that chapel in 1822, they were removed to the stone screen at the east end of Guildhall, where they remained until 1866, when the present oak screen was erected. The statues are in beautiful preservation with the exception of that of Charles I., the face of which is slightly battered. They are held in high estimation as works of art, the flowing robes of the statue of Queen Elizabeth being very gracefully carved, while the details of the armor in which Charles I., is represented have been very minutely observed.

Maspero and Mustapha. — All lovers of the Egypt of the Pharaohs have heard with delight of the successful way in which M. Maspero has succeeded in clearing out the horrid little colony of mud hovels which choked up the pillars of the beautiful temple of Luxor. But, although M. Maspero has succeeded in evicting the village, he has not been able to entirely free his resuscitated temple from all incumbrances. Every visitor to Egypt who has gone up the Nile for the last generation of men is familiar with the personality of Mustapha Aga, who has the honor to represent Her Majesty as consul at Luxor. Mustapha Aga has long lived in a house actually adjoining and adhering to one side of the temple of Luxor. Mustapha Aga is a shrewd old man, with more than the average Egyptian eye to the main chance, and M. Maspero's difficulty has been Mustapha Aga's opportunity. He absolutely refuses the sum — quite a large sum — which M. Maspero offers him to clear out and build a house elsewhere. He puts a price upon his domicile as fantastic as that which the famous Don Pacifico formerly put upon his bed and table linen. And until that price is given he declines to budge. Those who have ever passed an hour under Mustapha Aga's hospitable roof, or have been privileged to share in the pleasures of a fantasia got up by him for the amusement of English travellers, will scarcely think that the domicile of our representative is sufficiently splendid to call for this colossal remuneration. However, in the meantime Mustapha Aga holds his ground, and the process of clearing the temple remains at a standstill. — *Whitehall Review.*

The Manufacture of Hydrogen. — The communication which MM. Felix-Hembert and Henry have just made to the French Academy of Sciences has roused much anxious attention, not only in France but all over Europe. If the process which these gentlemen have described marks a new departure in gas-making, the matter is of weighty import, not only to the gas manufacturers, but also to the coal owners and ironmasters. It will affect in no inconsiderable degree the consumption of coal and modify some of the processes of iron manufacture. The communication to the Academy describes an improved method of making water gas, of producing pure hydrogen at an extremely low cost. A jet of superheated steam is directed into a retort filled with incandescent coke. The oxygen unites with the carbon to form carbonic oxide, and hydrogen is liberated. Up to this point there is nothing new in the process. But now these gases are led away to a second retort filled with lumps of some refractory substance maintained at a red heat. The use of the refractory materials is to expose a large surface to the incoming gases. Into this second retort there is led at the same time a jet of steam superheated to the point of disassociation. The oxygen of this steam seizes upon the carbonic oxide to form dioxide, and more hydrogen is liberated. To remove the carbon dioxide, the gasses are passed through milk of lime, and the pure hydrogen is led away to the reservoir. The authors of the communication say that one ton of coke produces about 96,000 feet of gas, which is about eleven times the quantity obtained from a ton of coal. Not the least astonishing part of the process is the cost of gas, which is said to be very low. It is easy to see the numerous applications of such a gas for heating purposes; but the inventors have arranged to make a start with it for lighting. How the carburation is to be effected is not stated, but it is announced that the little town of Boulogne-sur-Seine is to be lighted with this gas during the winter. — *Iron Age.*

The Stanford Collection to be given to San Francisco. — Mrs. Leland Stanford's collection of works of art will be presented to the city of San Francisco, and placed in a building in Golden Gate Park.

Prehistoric Palace found on the Acropolis, Athens. — The London *Academy* says: "We hear from Athens that the well-known archæologist, Dr. Dörpfeld, has discovered on the Acropolis, between the Parthenon and the Erechtheum, remains of a prehistorie palace, similar to those found at Hissarlik and Tiryns."

How to Cut and Trim Glass. — Take a twelve-inch mill file, single cut, and wet it with turpentine saturated with camphor, and the work can be shaped as easily and almost as fast, as if the material were brass. To turn glass in a lathe, put a file in the tool stock, and wet with turpentine and camphor as before. To square up glass tubes, put them on a hardwood mandrel made by driving iron rod with centres through a block of cherry, chestnut or soft maple, and use the flat of a single-cut file in the tool post, wet as before; run slowly. Large holes may be rapidly cut by a tube-shaped steel tool like a file on the angular surface, or with fine teeth, after the manner of a rose-bit, great care being necessary, of course, to back up the glass fairly with lead plates or otherwise, to prevent breakage from unequal pressure. This tool does not require an extremely fast motion. Lubricating as before, neat jobs of boring and fitting glass can be made by these simple means. The whole secret is in good, high steel, worked low, tempered high, and wet with turpentine standing on camphor. — *Exchange.*

An Architect's Suit. — A case recently tried before Judge McDermott, Circuit Court, Hudson county, N. J., possesses considerable interest and encouragement to all architects who are courageous enough to assert their rights. Frederick B. White, architect, brought suit to recover three-and-one-half per cent commission for furnishing working drawings and details for a house to cost $6,000, for W. A. Marshall. Henry E. Wills represented the plaintiff, and Randolph Parnsley and William Brinckerhoff, the defendant. Plaintiff proved by numerous letters from defendant that plans were ordered and that there were many consultations, etc. A competent builder testified that the house could be built for $5,900, and F. A. Wright, of Messrs. Rossiter & Wright, architects, gave expert testimony as to the value of the plans and the usual rate of compensation. The defendant claimed that the house could not be built for $6,000; that after trying to obtain satisfactory estimates, he had to give up the idea of building, the lowest estimate received being $7,500. He admitted ordering plans, but claimed that as they were of no use to him, he should not be obliged to pay for them. He further claimed that the plaintiff made a definite contract to make plans of a house that could be built for $6,000, and testimony to this effect was given. The Judge decided for the plaintiff, awarding him three-and-one-half per cent of $5,900, with costs of suit. — *Northwestern Architect.*

A Life for a Life. — A slater was engaged in repairing the roof of a house, and while so engaged, through some false step or some other accident, lost his balance and rolled down the slanting side of the roof, and fell over the edge into the street below. Just at this moment — unfortunately for himself, though fortunately for the slater — a man was passing along the street just in front of the house whose roof was being repaired. Upon him the slater feel, knocking him to the ground with such force that he eventually died of the injuries he received; while the slater does not seem to have been much the worse for his fall, being saved from any violent concussion with the hard pavement by the interposition of the body of the unfortunate wayfarer. The dead man's son brought an action against the slater, asking that he might receive punishment for killing his father, and be made to pay to him, the son, damages to compensate him for his loss. The King, before whom the matter was laid, inquired into it, and satisfied himself that the slater was in no way to be blamed, his fall and its fatal consequence being purely accidental. In delivering his judgment, he said that it was natural that the son should desire some satisfaction for the death of his father at the hands of the man who had killed him, and that this he was ready to order him. The slater must go and stand exactly in the position where the deceased man had been at the time of the accident, and the son might mount on to the roof of the house and throw himself thence on to the slater, and so mete out to him the same treatment as had been meted out to his (the plaintiff's) father. The son, however, like Shylock, declined to run the risks incidental to carrying out the judgment. — *Chambers's Journal.*

Electricity at the Explosion of Flood Rock, New York Harbor. — Only 600 of the 13,700 cartridges used in this large explosion were exploded by electricity, the remainder being exploded by the concussion produced by the ignition of those 600 cartridges. The electric fuzes were arranged in twenty-four circuits containing twenty-five fuzes each, and the electricity was supplied by a bichromate of potash battery of sixty cells. The method of firing the charge was by connecting the terminals of these circuits in cups of mercury, and a bent wire hung over them by a string containing electric fuzes fired by means of a key from a battery on the shore, and connected to the fuze in question by a sub-marine cable. This closing of the key also operated the shutters of cameras, which took instantaneous photographs of the explosion at intervals of one second. The same action of the key also sent a signal to several observatories, so that the amount of the vibration of the earth's surface and its rate might be noted. As the explosion was delayed some fifteen minutes, some observers had ceased waiting for the signal, while others kindly recorded seismographic vibrations of the earth's surface at the appointed time, but some quarter of an hour previous to the actual occurrence of the explosion. At the observatory of Harvard University, two hundred and twenty miles north-east of New York, a tremor of the earth was observed which began two and one-half minutes after the time of the explosion, and continued for about two and one-half minutes. — *Engineering.*

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 525.

JANUARY 16, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

ALL students of architecture will regret to hear of the death of James Fergusson, the celebrated author of the "*History of Architecture*," and its predecessor, the "*Hand-book of the History of Architecture*," which have done more for the education of the young architects and laymen of the present generation in this important branch of knowledge than all other works combined. The paragraphs announcing his death give, as yet, little information in regard to him, but it is our impression that the most active portion of his life was spent in mercantile business in India, where he accumulated a fortune. Either through the influence of previous training, or from natural inclination, he was led, during his residence in India, to employ his leisure moments in the study of the architecture of that country; and the results of his investigations, which were carried on with characteristic intelligence and energy, are collected in his book on "*Indian Architecture*," which forms a separate volume of his "*History of Architecture*," and is probably by far the best existing treatise on the subject. On his return to Europe he extended his study to the architectural work of more civilized countries, and collected an immense amount of material in the shape of books, prints and photographs, which, verified by examination of hundreds of the more important buildings in the world, served as the basis for his "*Hand-book.*" This, originally issued in two modest volumes, was received with extraordinary favor, and edition after edition was issued, until the author, dissatisfied with the limited plan of the work, replaced it by the more comprehensive "*History of Architecture*," which, in its turn, has passed through many editions, and has, we believe, been reproduced by two publishers in this country. Of late years Mr. Fergusson has become more closely identified than ever with the profession to which he has always had so strong an attraction, and has, we believe, executed several designs of great merit, besides distinguishing himself by projects for restorations and similar works. Many years ago he was elected a Fellow of the Royal Institute of British Architects, and was, to the time of his death, one of its most faithful and respected members, although his reputation rested on his literary, rather than strictly professional work. The distinction between the two is, however, less marked in England than in this country, and the Royal Gold Medal, awarded every year to some architect of merit, was, in 1868, given to him for his book on "*Tree and Serpent Worship in India.*" One of his favorite studies was the restoration of ancient buildings, and if his theories on this subject do not always show profound thought, they have always been ingenious, while his theories are put forward with a zeal of conviction which excites the sympathy of the reader. His last essay of this kind, published seven or eight years ago, was devoted to the Temple at Jerusalem, with the other buildings within the sacred enclosure, but he had, long before, engaged in similar discussions of the buildings at Nineveh and the hypæthral construction of the Greeks.

ALTHOUGH filled with the evidences of close observation and accurate thought, Mr. Fergusson's books are, to a certain extent, encumbered with theories, or rather digressions, upon all sorts of subjects which are pursued, to the detriment of the main work in hand, to conclusions which often fail to win the approbation of the reader. Nothing is more seductive than an opportunity for promulgating speculations which no one can contradict as to the habits and character of races which no one can possibly know anything about, and Fergusson was, perhaps, the more excusable from his being the immediate successor, as a writer on architectural history, of Mr. Ruskin, whose books, we need not say, are little more than masses of digression from the main topic. Mr. Fergusson's excursions are, however, far from possessing the charm of Mr. Ruskin's, and the opinions contained in them are sometimes expressed with a rather irritating positiveness. For all this, however, his work is thoroughly well done; and if students have later to unlearn some of the things they get from his books, they have no great reason to complain, while the earnestness with which he pursues and illustrates his ideas inspires young readers with an interest and enthusiasm which help them greatly in their study of the subject.

ONE of the best known among the younger architects of New York has just had occasion to enforce his right to be paid for his professional work in a way which will interest many in the profession. Some time ago the New York Athletic Club resolved to build a new club-house, and, as usual in such cases, decided to take advantage of the good-nature of some architect to have its own vague ideas brought, without trouble to itself, into practicable shape. The profession was well represented in the person of Mr. H. Edwards-Ficken, and he was accordingly requested to prepare sketches, first for a lot in the middle of a block, and afterwards for a corner lot. It was finally determined to build upon the latter lot, and Mr. Edwards-Ficken proceeded to develop his plans, while a building-committee was appointed to see to the details of construction. Mr. Edwards Ficken had gone so far as to obtain estimates for carrying out his designs, when he received a letter from the building-committee informing him that his services as architect were no longer required. He went immediately to the committee for an explanation and was informed that an estimate of one hundred and sixty thousand dollars had been made upon his plans, which far exceeded the sum, one hundred and five thousand dollars, set by the club. Mr. Edwards-Ficken answered this by offering the bid of a responsible builder, accompanied by a bond, to construct the club-house according to his designs for one hundred and five thousand, but he was not listened to, and a few days afterward a set of plans prepared by Mr. H. W. Clinton was adopted by the committee, and a contract made for executing them for one hundred and eighteen thousand dollars. While the building was going on from Mr. Clinton's plans, Mr. Edwards-Ficken took steps to secure justice for himself, and placed his claim for full commission in the hands of counsel. The case was decided by a referee, who, after a long and patient hearing, awarded him the whole amount claimed; and the club ordered its treasurer to pay the award at once. The most curious part of the story is given by a reporter of the *World*, and, although we know nothing of the accuracy of this portion of the account, and hope, indeed, for the credit of the discrimination of the club in regard to its selection of members, that it is not necessary to believe it, the moral which it contains, if only a small part of it is true, is too important to be neglected. According to the *World* reporter one of the more active members of the building-committee was a dealer in brick, tile and cement. This gentlemen, it is said, was of opinion that it would be well to use a good deal of brick and tile, together with cement, in the new club-house, and was disappointed to find that Mr. Edwards-Ficken had not seen fit to use these materials with the lavishness which he thought desirable. Mr. Clinton's plans, which appeared later, had much more of the brick-and-tile character than the first, and seem to have won from him enthusiastic and effectual approval. With the committee, or at least an important part of it, in this state of mind, nothing was needed but a little of that juggling with estimates so familiar to persons versed in building matters to conjure up an excuse for getting rid of Mr. Edwards-Ficken and his design, and substituting

the other; and it is probable that no one in the club notices that the building, as actually carried out, is said to have cost, already more than a hundred and fifty thousand dollars, although many bills yet remain unpaid. Whatever may be said as to the relative richness in brick, tile and cement work of the two designs, it is certain that the club now possesses a beautiful and convenient building; and if Mr. Edwards-Ficken could have designed a better one, as indeed we are very willing to believe possible, the artistic, as well as the athletic world has lost much by the circumstances which prevented him from carrying out his ideas.

THE *Builder* publishes the new official regulations for receiving tenders for public works in Germany, which have a very considerable interest. Under the new law, which was drawn up after consultation with a number of leading contractors and manufacturers, bids must be invited publicly for all work and materials of which the estimated cost exceeds two hundred and fifty dollars, except in five cases; the exceptions being made where the work or materials desired are such as can only be suitably executed or supplied by a limited circle of contractors; where suitable proposals have not been received in a public tender already held; where there is urgency for execution; where the work requires special artistic skill; and where supplementary orders are given for materials to complete certain work, provided the price paid is not higher than the original contract price. In calling for tenders, precise stipulations are drawn up, and as far as practicable the tenders are divided so as to allow persons of different trades to participate, while in some cases an extensive contract may be divided up into lots, so as to bring each section within the resources of contractors of moderate capital. The advertisement of invitation is published in the official journals, and two weeks is allowed for preparing estimates for small works, and four weeks for large ones. Two weeks after receiving the bids, the award is made, unless a further delay should be necessary for obtaining the approval of superior authorities. On the day assigned, all the bidders are invited to be present, either in person or by representatives, and the tenders are read without giving the names of the bidders. A paper is then drawn up, containing the names of the bidders, with the amount of their tenders, and this is shown to all the persons present, and signed by them, but no further publication of the tenders is allowed to be made.

IN considering the tenders those are at once thrown out which do not conform to the required conditions; or which are accompanied by unsatisfactory samples; or which are so evidently out of proportion to the normal value of the work that proper execution could not be expected at the price named. Among the other bids no preference is necessarily given to the lowest, but if all of them are, in every respect, acceptable, and offer satisfactory guaranties for the efficient and punctual execution of the work, the award is, as a rule, given to that one out of the lowest three which seems, under the circumstances, most advantageous. If none of the lowest offers are acceptable, all the tenders are refused; and in the case of building-work the bids of contractors living near the work are, other things being equal, preferred to those of persons living at a distance. After the award is made, a formal contract is to be signed, except where the subject-matter of the agreement is of less than two hundred and fifty dollars' value; or where the work is to be done by the day; or where an understanding as to the essential conditions of the agreement has already been arrived at by correspondence. The formal contract is drawn up concisely, and in the way usual for private work. The general recital of the agreement comes first, followed by the dates for partial and complete execution; the amount and mode of payment; the penalties for non-fulfilment; the security to be given; and the appointment of arbitrators. The stipulations in regard to most of these items follow the usual rules of private practice; but it is provided that, in case the contractor fails to pay his workmen or sub-contractors, so that the work seems likely to suffer or be delayed, the party of the first part may make payments directly to these persons and charge them to the account of the principal contractor. As in the best private practice the employment of arbitrators is carefully restricted, and in building-contracts arbitration is confined to the settlement of differences as to the cost of extra or unexpected work. Among the general conditions for building-contracts it is provided that the contractor, or his representative, must be at the building whenever the officials who control the work consider it necessary, and that the latter shall have authority over the contractor's workmen in matters affecting both the execution of the work and the maintenance of order; that no sub-contract shall be made without the consent of the official directors; that each contractor shall be responsible for all his tools and materials; for the observance of all police and statute regulation, and for the acts of all his assistants, deputies and workmen in the execution of the contract. In regard to scaffolding it is provided that, while that erected by the principal contractor is standing, workmen belonging to other trades can use it gratuitously; but he is not obliged to make alterations in it for the convenience of any workmen except his own. For the strength and safety of the scaffolding the contractor to whom it belongs is responsible, but he is obliged to strengthen or complete it without delay at his own expense, upon being ordered to do so by the officials in charge.

WE are sorry to see in the daily papers some ferocious-looking paragraphs about the preparations which the superintendent of the Edgar Thomson Steel Works, at Braddock, Pennsylvania, has made for shooting, stabbing or mutilating the workmen who have for years been supporting their families on the wages paid them by the company, but are now, through what seems to be a paltry disagreement, locked-out of the only place where they can earn their daily bread. According to the Philadelphia *Press*, the boundary of the company's estate has been constituted a "dead line," and any workman who crosses it will be murdered on the spot. The natural inquiry whether the laws of Pennsylvania have ceased to prevail over the township of Braddock is met by the information that the superintendent is "a man of indomitable will," by which it seems to be intended to convey the idea that he is permitted to slaughter his fellow-citizens at discretion. We can hardly believe that the officers of the company, one of whom is rather conspicuous for his good sense in dealing with workmen, will countenance these martial demonstrations, but if they do, we may remind them that they will have only themselves to blame for the consequences of any struggle which their folly may provoke. No doubt it is foolish for workmen to strike until a disagreement as to whether they shall work eight hours a day or eight and two-thirds has been settled, but for those who hold a different view from them of the matter in dispute to rush at once for their guns and pistols is not only foolish, but criminal. It must be remembered that on the side of the officials are comfort, resources, and an assured future, whatever may be the event of the struggle, while with most of the men a few dollars only stand between their children and starvation; and if we condemn the latter because they sometimes become desperate as time goes by and their last hope leaves them, what shall we say of the others who have nothing to lose by patience, moderation and forbearance, but who choose instead to set the example of snatching up weapons with which to put to death the men who have so long worked with them and for them, and to fill the town in which they all live with starving widows and orphans made by their hands?

WE find a rather romantic little story in the *Courrier de l'Art*, about the great painter Vandyck. Some fifty years ago a tradition was still current in the little town of Saint-Jean de Maurienne, on the old Mont-Cenis route between France and Italy, that some famous Dutch painter had, more than two hundred years before, been taken sick there while travelling to Italy, and had been cared for by a hospitable burgher named Borelly. A little daughter of the family, ten years old, helped to take care of the sick stranger, who, before he resumed his interrupted journey, drew, on a leaf from an account-book, a life-size portrait of the child, which he signed and left as a remembrance of himself and his gratitude. From other sources it is known that the great Vandyck once passed through Saint-Jean de Maurienne on his way to Italy, and was taken sick there; and a search for the drawing was recently undertaken by the Marquis de Beauregard, an amateur of reputation. Although continued for a long time, his search was fruitless, so far as he was concerned, but his example inspired other persons to make investigations, and the drawing was found, not long ago, in good preservation.

STUDIES IN THE RENAISSANCE.[1]—II.



IN our last chapter under this heading, we traced some elements of the Renaissance which we found in a few fragments of old carvings in Pistoja and Florence. Those examples had mainly to do with the treatment of cornices, friezes and carved panels, and the classic origin of most of the detail was easily recognized. Before returning to the consideration of panels and arabesques, a few studies of Renaissance columns may be profitably interpolated at this stage of our researches. We have already referred to the fact that while most of the forms which present themselves in the Renaissance are more or less imitations of ancient creations, still, the adoption of the old lines led to many surprising and delightful conceptions which are quite free from the taint of plagiarism. This originality of treatment is noticeable in the columns of the revival period, more particularly those which are associated with its early development. To prevent subsequent confusion, we may here, before discussing the columns, briefly explain that the Renaissance, like the Gothic, can be divided into several periods, and it is as well that the student should get an idea of the various characteristics. These differences have, however, more to do with architecture than ornamental detail, and as the analysis of the latter is our present object, we need not point out at any great length, the distinctive features of "Florentine," "Venetian," and "Roman" Renaissance.

In its first stages, during the fifteenth century, the new style did not effect the general lines or main features of the buildings, but rather told upon the ornamentation and aspect of the profiles. The columnar orders, with their various entablatures, and their decorative details generally, were cleverly grafted upon the forms of the previous style — the Romanesque. A desire for what is known as the "picturesque" in architecture still manifested itself, and the increasing demand at that time for palatial residences and castles gave more opportunity for its exercise than was afforded by the erection of mere ecclesiastical edifices. To the fifteenth century



Figure 1. Court-Yard of the Palazzo Vecchio, Florence.

these "Early Florentine" and the "Early Venetian" Renaissance styles strictly belong.

The illustrations which appear herewith have to do with the first of these epochs, and they will be explained presently. In the meantime, we may just indicate that the lines upon which the Venetian and the Roman Renaissance were founded, were more definitely Classic. This latter style did not develop until the sixteenth century, and its growth was very much assisted by the publication of the works of the old Roman architect Vitruvius. They were translated into Italian and printed in 1521, becoming the text-book of Classicism, and giving new life and more authenticity to the growingly popular revival. Bramante, the architect who drew the original plan of St. Peter's at Rome (1444 to 1514), was the founder of this more strictly classic Renaissance, and coupling with his name that of Vignola (1507 to 1573), and Michael Angelo (1474 to 1564), who completed Bramante's design for St. Peter's, we get, by keeping that noble edifice in mind, a good idea of what is meant by the Roman Renaissance.



Figure 2.

The Venetian phase of this return to antique forms cannot well be explained without the aid of elaborate architectural illustrations. Indeed, it was only when sailing down the Grand Canal, Venice, that we could fully appreciate the wonderful way in which the old Venetians had dressed up their ancient Byzantine models in rich Renaissance clothing, carefully preserving many of the beauties and much of the coloring of the former style. The manner in which the buildings are jewelled with fine marbles, such as red porphyry and green serpentine, requires personal inspection, and a careful reading of Ruskin's "*Stones of Venice*" to be thoroughly appreciated. Semi-circular gables, such as adorn the *Scuola di San Marco*, give a cupola-like appearance to many of the buildings, which is quite in keeping with the Oriental-looking superstructure of the Byzantine church of St. Mark's. In the earlier structures, a free combination of Byzantine and Classic elements is attempted much in the same way as in England the Gothic overlapped the Italian and produced "Elizabethan," with the happiest result. Later on, the Venetian architects conformed more closely to the principles which were laid down by Vitruvius; indeed, the style of Palladio (1518-1580) was almost identical with that of Michael Angelo. Having thus briefly tried to make clear, as far as mere description will serve, the leading characteristics of the Florentine, Venetian, and Roman versions of the Renaissance, we will return to the former in order to particularize its main features.

Our present study will not extend beyond a few columns, and in searching for suitable examples, we cannot, we think, do better than invite our readers to step into the court-yard of the Palazzo Vecchio — or the ancient palace — at Florence. It so happens that Mr. C. H. Blackall gave, in our issue of June 30th last, a full description of this interesting old place, and our readers will find that able historical and architectural article a useful preface to the consideration of the more decorative details which are here illustrated. For the information of those who have not that article at hand we may say that the imposing fortress-like building which is now known in Florence as the Palazzo Vecchio dates from the thirteenth century. It was designed in 1298, by Arnolfo del Cambio, the skilful architect who, a few years later, judiciously restored and thus saved the renowned Baptistery of the same city. He also built the cathedral. The Palazzo itself is distinguished for its massiveness rather than for symmetry, and altogether its crude and ponderous proportions and tower are in marked, but not unpleasing, contrast to the more refined edifices of *la bella Firenze*.

The grand old place seems still to breath forth the spirit of the republic whose forum used to be what is now the Loggia dei Lanzi. One can imagine its commanding tower frowning — its battlements answering for beetling eyebrows — upon the scenes of cruelty which were enacted in the Piazza della Signoria beneath. The simile is not too imaginative, for both the corbelled cornice and castellated summit of the structure had a political significance, the latter form being used exclusively by the Guelphs and the swallow-tail form of the battlemented top indicating the power of the Ghibelline faction.

The old place teems with similar reminiscences of political and religious feeling. Over the door there is now the inscription "*Rex regum et Dominus dominatium,*" but it used to be "*Jesus Christus Rex Florentini Populi S. P. decreto electus,*" showing how, early in the sixteenth century, the Gonfalioner, Nicolo Capponi, persuaded the people to elect the Saviour of Men as the king of the Florentines, thereby hoping to escape the power of the Pope, the French and the Medici. We must not, however, spend longer time in gazing upon the rough rubble stonework of the interior, but at once enter the court-yard, for it is therein we find the Renaissance studies, which it is the object of this article to explain. In order to make clear the position of the columnar details, we annex a sketch of the court-yard (for larger illustration see our June number), and we commend the study of it in this complete form as giving a capital idea of the early Florentine Renaissance to which we have already referred.

[1] Continued from No. 516, page 233.

The round arches, the sturdy columns, the escutcheons in the spandrels, and the shape of the windows above all, show how Romanesque lines have been used as a foundation for a Renaissance finish. Before examining in detail the beauties of the columns, we may take a general view of the suggestive court-yard.

In the centre, Verrocchio's boy and fish serve as the fitting ornament for a refreshing little fountain, the basin of which is of costly porphyry. At the back a Samson and a caricature of Michael Angelo, in the shape of a Philistine by Rossi, excite the admiration or irascibility of visitors. Unfortunately our sketch does not show the indistinct frescoes of various Austrian towns which adorn the walls or the vigorous arabesques which serve to ornament the vaulted roof. The armorial bearings in the spandrels are very significant; the lily standing for Florence; the cross for the people; the eagle for the *Parte Guelphæ*, and the balls for the Medicis; the combined red and white of Florence and Fiesole completing the symbolism. But the stately columns are the charm of this court-yard. We well remember how they impressed us so much by their massiveness and appropriate enrichment that we could not rest content with the general view which this miniature sketch affords, but felt bound to secure such details as are figured herewith. These columns only date from 1434, for they were in that year substituted by Michelozzo Michelozzi for some slender brick supports which had proved to be too weak to carry the superstructure. This architect achieved a great reputation for thus cleverly holding up the building while he substituted these fresh columns, for at that time the principles of successful shoring were hardly understood. The decorations which cover the columns are of stucco only, but they command, we think, as much respect as stone or marble, both because of their antiquity and their remarkable vigor. The decorations of the columns are all different, and among them may be found most of the ornamental details of the Renaissance. Indeed, we do not remember to have met, throughout the whole of an extended tour in Italy, a more compact *vade mecum* of the style, if we may so express it, than is found wrapped up in, or rather around, these columns.

These enrichments appear to have been added to Michelozzi's pillars in the year 1565, by way of brightening up the place in honor of the marriage of Francis de Medici to Joan of Austria, niece of Charles V. It will be observed that this was the year after the death of Michael Angelo, and it is apparent that the various artists who decorated the shafts borrowed not a little from his masterly treatment. The groundwork of this decoration was originally gilded, the capitals being colored, which must have added considerably to the original splendor. The gilding and color have now given place to a soft, grayish-yellow, which is more restful, perhaps, and quite as satisfactory as the garishness of the original treatment. Having looked at these columns in their entirety, we may now dissect them, so as to discover what Renaissance elements they set forth. The first point of difference from the Classic is that most of the columns are octagonal, a feature which certainly gives them an individuality. Then we observe that they are covered with decoration from top to bottom, a decorative liberty which was never, or hardly ever, attempted in classic supports until the days of the revival. This class of enrichment is very noticeable in the columns of the fifteenth and sixteenth centuries; indeed, its presence on any such supports is sufficient to stamp them as Renaissance. When once the revivalists acquired the courage to thus dress up the Classic orders, there seemed to be no end to the rich variety of decorative garments with which they could clothe their columns. For instance, notice — in the miniature sketch of the court-yard — how the columns have been divided into dado, filling and frieze. Then, the admirable reeding of the dado, the ornamental treatment of the dividing band, the wealth of figure and flower subjects above, and, yet higher, the fitting detail on the shaft. The old Greeks or Romans, while travelling on much the same lines, never ventured beyond fluting, and their restraint in that respect is worthy of all emulation where pure Classic is required; but, on the other hand, the pleasure which is given by skilfully intensifying the beauty of a column, after the manner here

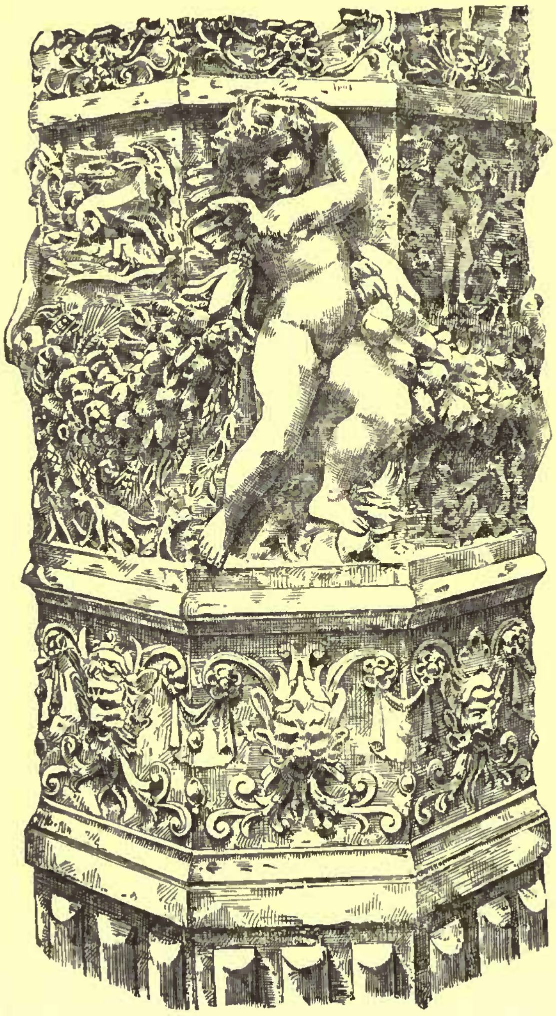


Figure 3.

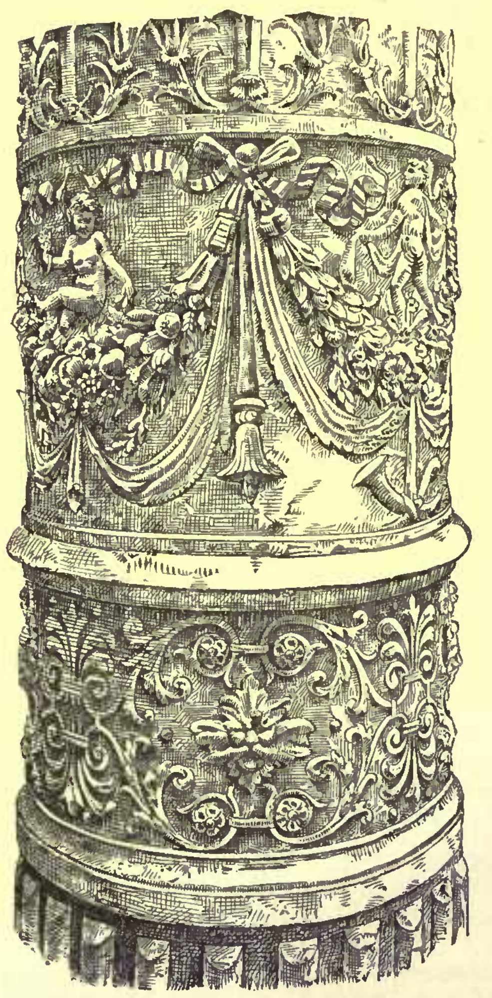


Figure 4.

shown, must, we think, be admitted and enjoyed. Like most of the decorative work of this period, the ornament varies in each case, but not sufficiently to interfere with the harmony of the whole. In the first bands, above the reeding, in both Figures 1, 2, and 3, we get a vigorous and different arrangement of scrolls and masks. No. 1 is very pretty: the scrolls springing from the heads with rosettes supporting drapery and tassels being a specially effective idea. The gambols of the Cupids, and all sorts of odd things in the space, are so full of suggestion: the sturdy little fellows, gleefully bearing the heavy swags of fruit and flowers, certainly form a lively and appropriate enrichment to this part of the column. And here we may draw attention to the important fact that the Renaissance must be credited with the parentage of most of that cherubic throng which has contributed so much to the beauty of modern decoration. The innocence and rotundity of the childish figure lends itself inimitably to the purposes of such decoration, and when, as in the case of Figures 3 and 4, the merry little boys are associated with fruit, flowers and animals, the result is all that can be desired. It will be observed in Figure 3 that the designer was so full of life he could not refrain from filling up his remaining space with miniature models of all sorts of animal forms — hybrid and other. What a contrast to the poverty of most of our modern carvings or modellings! Now-a-days

the designer or carver seems content if he can bring a simple swag or some bit of still-life into his enrichments. In the old days it would seem that the artist had so many figure-subjects running in his head, if we may so speak, that he had to crowd them into every available space. In Figure 2 the arrangement of this same decorative band is more conventional and restrained. Therein we get another disposition of Cupids and swags, which is altogether charming. The idea of tying up the swags by means of ribbon to the decorative and legged staves is capital, and the interpolation of the rams' heads (see right of column) is equally good. Both of these bands are bristling with "go," and our regret is that our pen-and-ink sketches are not able to convey half the *chic* which is to be found in the originals. The beautiful manner of the scroll and figure treatment of the shafts which are above the Cupid bands in both Figures 3 and 4, will be evident without explanation. Those who are familiar with Grecian ornament will recognize the honeysuckle, or anthemion form, served up amid new surroundings, and all will recognize how perfectly this decoration covers the surface which it enriches — no one portion obtruding itself — and how the general effect is restful and satisfying.



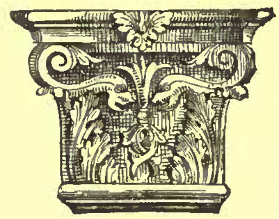
Figures 4 and 5.

In this composition the artist has not hesitated to bring into his design things as diverse as ribbons and carrots, jewelry and wheat, satyrs and flowers, and yet they are so adroitly combined that the result is rich and harmonious. Speaking of wheat reminds us of the shaft of another column by Benetto, from Rocezzano, which will form a fitting corollary to these selections from the court-yard of the Palazzo Vecchio. For the sake of convenience we give it in two parts, Figure 5 being the base and Figure 4 the continuation. In this delightful column we get another class of treatment, decidedly Florentine in feeling, which shows how marvellously the decorative plants of the ancients grew when watered and tended by the artists of the Renaissance. This is apparent while tracing design No. 5 from its base upwards. A noble lion mask serves, so to speak, as the flower-pot. From its ears there spring forth acanthus — clothed stems anon blossoming into wheat and flowers and all sorts of delicate tendrils. Rising yet higher the stems are made to pass through and support a sacrificial skull — here the pagan origin of the *motif* shows itself — and above, birds rest on their branches. How the skull supports a winged-head which, in its turn, gives forth other prolific stems, the drawing will explain. The delicate and long-drawn-out treatment of these stems and tendrils, and the low-relief of most of the work, may be taken as specially characteristic of the *cinque-cento*, that graceful phase of the Renaissance which flourished particularly in Florence. Here again in these columns we find the same diversity of materials as in the columns of the Palazzo Vecchio, with equal skill in their arrangement, and the "all-over" covering of the surface which has to be decorated. These illustrations, few and fragmentary though they are, should make clear the difference between Classicism and its prolific successor. Nothing can be found among either old Grecian or Roman remains which entirely accords with with these examples, and yet every item of the compositions gives evidence of being inspired by the creations of antiquity. In order to show how this applies to the capitals, as well as the shafts, of columns, we annex a few examples of the former as initial cuts. It is interesting to notice how, in these caps, the unimprovable general outline of the ancients has been combined with fresh subject-matter. The sketches are sufficiently explicit to be independent of explanation, and we may confidently leave this set of examples to the study of those who are looking for material and inspiration wherewith to design columns in the Renaissance style. What we have tried to make clear by the aid of these sketches is, first, the characteristics of "Early Florentine" which come of its association with Romanesque; secondly, the way in which the artists of that time, unlike the ancients, covered their columns with decoration; and lastly, the great variety, but perfect unity, of their compositions.

There is just one danger that some students of these and similar examples may fall into, and one which cannot be too frequently pointed out, viz., that of merely sitting down and copying such details as these without any alteration whatever. Where in the world would the Renaissance of art have been, if the old Italian masters had merely contented themselves by copying excavated bits of classicism? All the freshness and life about which we have been speaking would, of course, have been absent. Let the designer of to-day act in a similarly sensible way. If he has a column to enrich, he has no occasion to borrow from the mythological scraps of antiquity. The skulls of bullocks or rams have but little meaning or artistic merit now. He will do much better if he tries to string together the men and material of his own country or district. If onions or sunflowers, rabbits or snails flourish in his back garden, let him not hesitate to bring them into his composition. They will look just as well, if disposed with equal skill, as the natural forms, mostly Italian, which cluster round the shafts of the columns here illustrated.

J. WILLIAMS BENN.

HEATING AND VENTILATION OF THE OPERA-HOUSE, FRANKFORT-ON-THE-MAIN.



THE opera-house at Frankfort affords a striking illustration of how much one may gain by judicious comparative studies in special lines made before beginning the plans of an extensive building: indeed, in visiting the opera-house one cannot but be impressed with the extent to which ideas from France, England and Germany have been utilized and combined in a manner evincing a more careful consideration for details than is customarily met with in European play-houses, and which, from a practical standpoint if no other, makes this one of the most successful buildings of its kind on the Continent. It has not the lavish magnificence of the opera-house at Paris, nor the size of that at Vienna, but perhaps the spectator would enjoy himself better here than at either of the others, surely so far as bodily comfort and convenience are concerned; and though it is much less pretending, it is of quite as much value to the student in search of practical ideas. Especially is this true as regards the arrangements made for the heating and ventilation. It is no discredit to the planners thereof to say that the system has some of the same features which are found in the Houses of Parliament at London and in the opera-house at Vienna; indeed, there is evidence that both of these buildings were very carefully considered, if not actually taken as models; and while not elaborated to quite the nicety of control which distinguishes the work in the Houses of Parliament, the heating and ventilating appliances of the Frankfort Opera-House are arranged in a manner which is quite as well adapted to existing conditions as those of the London example, while the Frankfort building has the advantage of having been planned with direct reference to the system to be used, whereas the London arrangement is an adaptation throughout. Perhaps, however, this cannot be considered as altogether an advantage, for it is oftener easier to deal with the tangible walls and spaces of an existing structure, than to think out on paper in all its details the elaboration essential to the proper heating and ventilating of a large hall of audience.

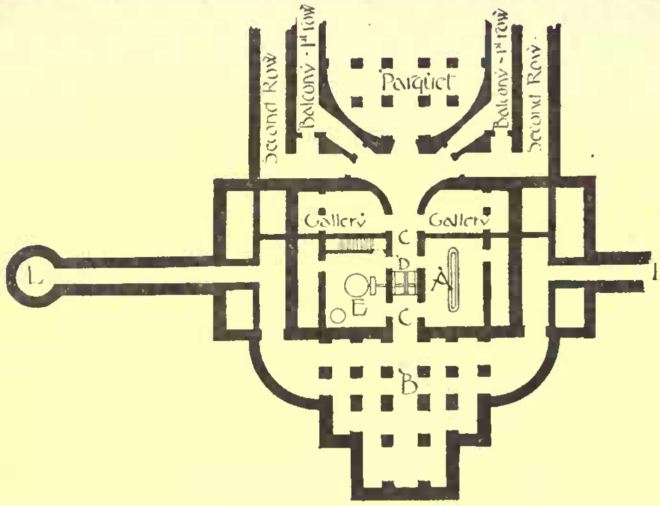
A difficulty which is often encountered in planning for ventilation and heating work is the unwillingness of those for whom the building is to be erected to allow the architect sufficient space and money to carry out anything more than a mere system of ducts conveniently buried in the thicknesses of the walls. So many building-committees are prone to regard heating and ventilation as something which, while quite necessary, can be classed with window-screens or night-watchmen, and tucked in somehow without any material cost. Apparently no such trouble was met with at Frankfort. Almost the entire cellar is devoted to the distribution of fresh, cold air, and a story above of area quite equal to half that of the entire building is allotted to the heating arrangement, the chambers even being in three tiers under the parquet; while all of the space immediately above the auditorium is occupied by the exhaust-pipes, fans, etc., for extracting the vitiated air. Whence, as will readily be seen by the section, quite one-quarter of the entire cubical contents of the building forward of the proscenium arch is given over exclusively to works of heating and ventilation, a proportion which seems excessive when thus stated, though a visit to the building itself does not give one any idea of waste room.

In order that there should never be a necessity for having fires in any portion of the opera-house, the entire plant of boilers, steam-pumps, etc., are located in a separate building on the opposite side of the street. The heating is by steam, which is generated in four tubular-boilers, with an expenditure on the average of about four tons of coal daily, or rather nightly, as of course very little heat is required during the day. Aside from heating, steam is used only to run the ventilating-fans, as hereafter explained: the powerful pumps kept as a reserve force in case of fire are worked by gas-engines.

A wide tunnel under the street connects the boiler-house and the opera-house. Through this the steams mains are led to the distributing room, marked A on plan of cellar, from whence branches lead to the various heating-chambers, the supply of steam being regulated entirely from this point. The steam-traps for collecting the water-of-condensation are all grouped in a corresponding room near the front

of the stage, whence the water returns by gravity to a tank in the boiler-house, and is pumped back into the boilers.

The opera-house is entirely isolated, with wide-paved streets on all sides, and clean surroundings. Hence no devices are necessary for purifying the fresh air which is introduced into the building. The



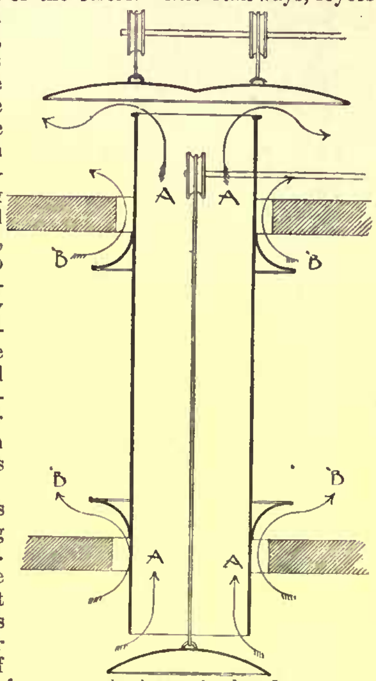
plan of the cellar given herewith is sketched from notes taken at the building, and will serve only to indicate the relative disposition of the rooms. The letters on the plan refer also to the section, which was copied directly from the engineer's drawings. The intakes for fresh air are located on either side of the building at L, the air being drawn from wells opening in the middle of the streets, and covered simply by an iron-wire gauze, the opening being hidden by shrubbery. The air passes thence through a tunnel, and a short corridor to the room B, where are arranged a few coils of steam-pipe which serve to warm the air slightly, moisture being added to any desired extent by means of fine sprays operating along-side of each line of piping. The air is drawn thence into the passage C, which corresponds with the line of the sectional drawing. This passage is three metres and a half wide, and four metres high. The cellar bottom throughout is covered with asphalt.

At D is located a helicoid fan, three metres in diameter, motive force for which is supplied by a fifteen horse-power engine placed in the adjoining room E. The fan is usually run at a velocity of from ninety to one hundred and twenty revolutions per minute, and at this rate is capable of moving approximately 80,000 cubic metres of air per hour. As the supply of fresh air for the entire house is drawn through this fan, the allowance per person cannot be over thirty cubic metres, a large proportion of the air being necessarily diverted to the foyers and stairways. The auditorium seats nearly 2,000 persons.

Beyond the fan the central passage leads directly to a chamber under the auditorium, side passages branching to rooms which serve other portions of the house, as shown by the cellar plan. It will be seen that the chambers are arranged in such manner as to allow of heating the various galleries quite independently of each other, if desired; while by easily-controlled gates the several intakes for cold air can be closed or opened, and additional ventilation supplied to any portion of the house without interfering with the heating arrangements elsewhere.

From the passages the air enters a series of chambers, all of which are essentially the same in principle as those which serve the parquet. As these last are shown by the sectional drawing the description will be confined to them. The chambers are in three tiers. The lowest is designated as the cold-air chamber. Above it is the heating-chamber where the air is made to pass over and through coils of steam-pipes arranged about the floor. The uppermost apartment serves as a mixing-chamber where the temperature of the air can be made uniform so as to ensure equal draught through all of the flues serving the rooms above. The three chambers are directly connected with each other by a number of iron cylinders about one metre in diameter, by means of which air reaches the upper compartment. The sketch given herewith will serve to illustrate this disposition. Each cylinder is provided with a movable top and bottom. When both top and bottom are open, which is the usual condition while the heating-apparatus are in operation, air will reach the uppermost or mixing chamber in two ways: first, directly from the cold-air chamber through the inside of the cylinders, following the arrows A, and entering the mixing-room at the same temperature it leaves the fan; second, rising through the floor openings outside of the cylinders, following the arrows B, entering first the heating-chamber where the temperature is raised to any desired degree, and then ascending to the upper chamber to mix with the colder air. The idea of all this multiplicity of chambers and cylinders is of course to equalize and control the temperature of the air supplied to the auditorium. If the temperature in the mixing-chamber falls, an attendant is on hand who closes wholly or in part the bottom of the cylinders, thus allowing only heated air to ascend. If the temperature rises the top and bottom are closed, and the supply of steam diminished in the heating-chamber. It is however, not easy to understand just why there should be movable valves at both top and bottom, as the upper one would seem to suffice for all needs, though, in fact, both are used as here described. Flanges are placed on the cylinders at top and bottom of the heating-chamber in such a manner as to deflect the currents of air towards the steam-pipes.

The warm air rises into the parquet through registers in the floor under each seat. These registers are always open, and cannot be interfered with by the public in any manner. For the balcony and upper rows the heat ascends in flues built into the walls, and escapes through registers in the faces of the risers. The stairways, foyers and lobbies are provided with wall registers near the floor, though for these apartments there is naturally not the same necessity for control of the air-supply as there is for the auditorium. Direct radiation is used nowhere in the building, though the small dressing and property rooms are heated by direct-indirect radiation, the steam-coils being built into the panel-backs under the windows, and receiving a supply of fresh air in the same manner as is customary in the United States. So far as could be ascertained there is no supply of heat to the stage further than what would come from the gas at night, which is doubtless quite sufficient.

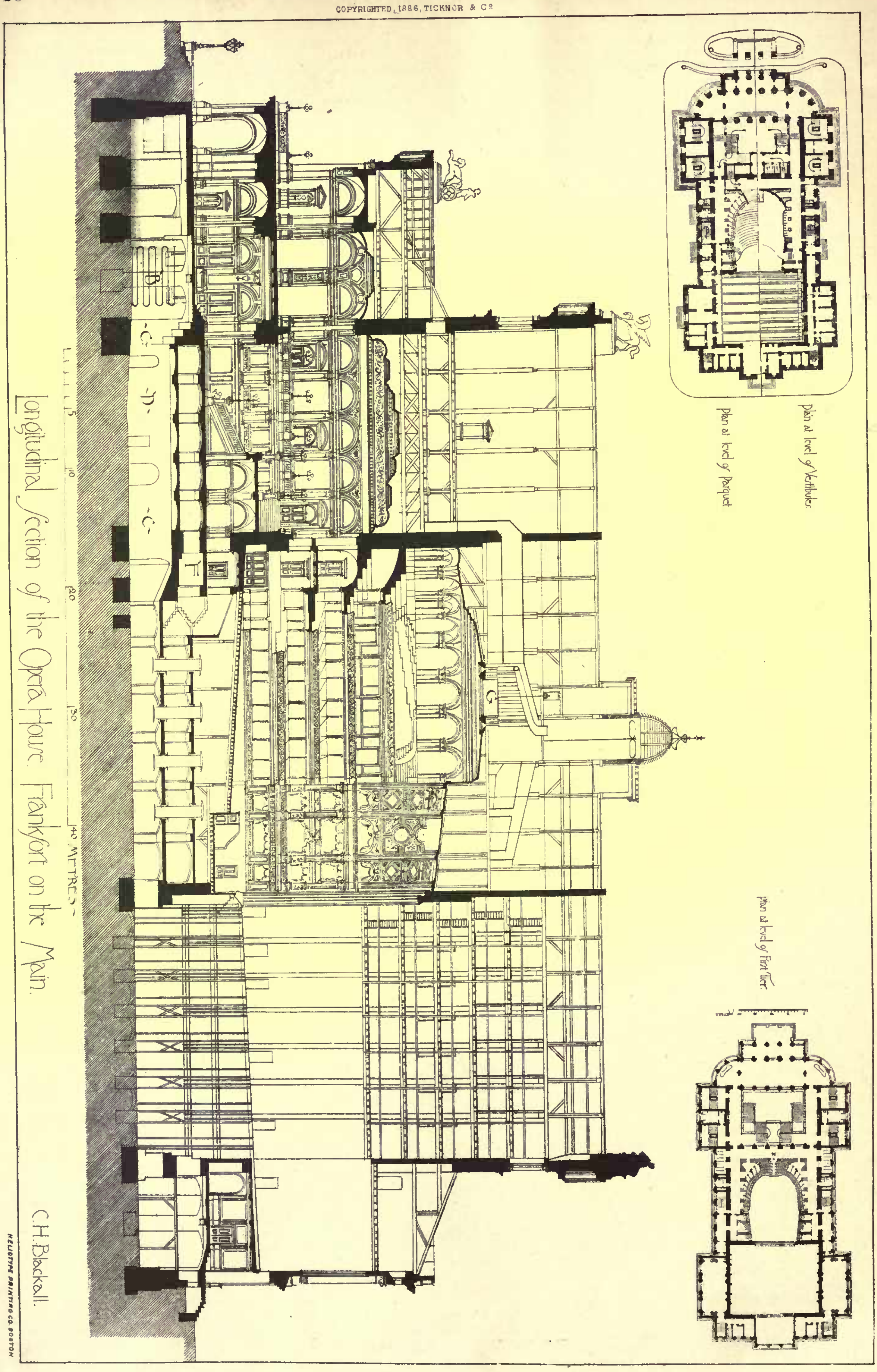


There are no arrangements of any description for cooling the air during warm weather. Practically it is found that the temperature of the house at the beginning of the evening is always several degrees lower than the temperature out of doors. and during the height of summer the house is closed.

The facilities for extracting the vitiated air are as complete as those for supplying the heat. Every *loge* has a large ventilating register near the ceiling; under each gallery extends an almost continuous line of exhaust-registers; and all of the corridors, stairs and cloak-rooms are abundantly provided with flues. Wherever one can find an obscure corner which in any other theatre would be suggestive of indefinite odors, there is sure to be found an ample ventilator immediately overhead, and apparently all these registers are put in place to some purpose, for there is not a corner anywhere about the building which does not smell sweet and clean. The grand stairway and the foyers ventilate through openings left between the modillions of the cornices. From all of these ventilating registers the vitiated air is led through flues in the wall and galvanized-iron ducts to the loft immediately over the auditorium, where all the exhaust-pipes unite into a large iron chamber located above the central chandelier of the hall, and discharging into a ventilating-shaft, three metres in diameter, which is carried a few feet above the roof, and ends in a cupola with open slatted sides. Near the top of the shaft is an exhaust-fan worked by steam-power, which is used to force the ventilation when necessary, though after the gas has been lighted in the auditorium, the ventilation will quite take care of itself, especially as the ventilating registers are so freely proportioned everywhere. Furthermore there is a ring of special ventilators immediately over the central gas chandelier, as shown by the section, and if desired the ceiling at G can be raised, allowing the heated air to escape to almost any extent. The consequence of this is that the air in the theatre can be maintained as pure at midnight as it was at seven o'clock, and the auditorium and hallways are quite free from the smell of gas which is so unpleasantly pronounced in the Paris Opera-House. And the stage, above and below, is quite as well ventilated as the house itself. There are large ducts leading from the stage-loft to the central ventilating-shaft allowing the ventilation to be forced, and there are, as well, open skylights in the roof.

A very marked feature of the system of heating and ventilating is its unity of control, if such an expression may be used to designate the manner in which the whole is brought under the very eye and hand of one person. At F of the section is a room which is styled the *control zimmer*. From this point the chief engineer, hardly having to leave his seat, can tell the exact temperature of any portion of the house, and can cause it to vary to suit his will. Short levers along the wall operate directly upon the gates in the cellar which admit cold air to the passages, allowing them to be wholly or partially closed. Other levers give a similar control over the valves of the exhaust-ducts in the attic. Either of the ventilating-fans can be started by electricity, and the action of the sprays which add moisture to the incoming air at B is controlled in the same manner. Speaking-tubes and telephones lead to the steam-distributing room in the cellar, to the mixing-chambers, to the stage, the boiler-room, etc. On one wall is an electric thermal indicator connected with a dozen or more parts of the house. In appearance it is like an ordinary hotel annunciator, with six or eight blank discs above and

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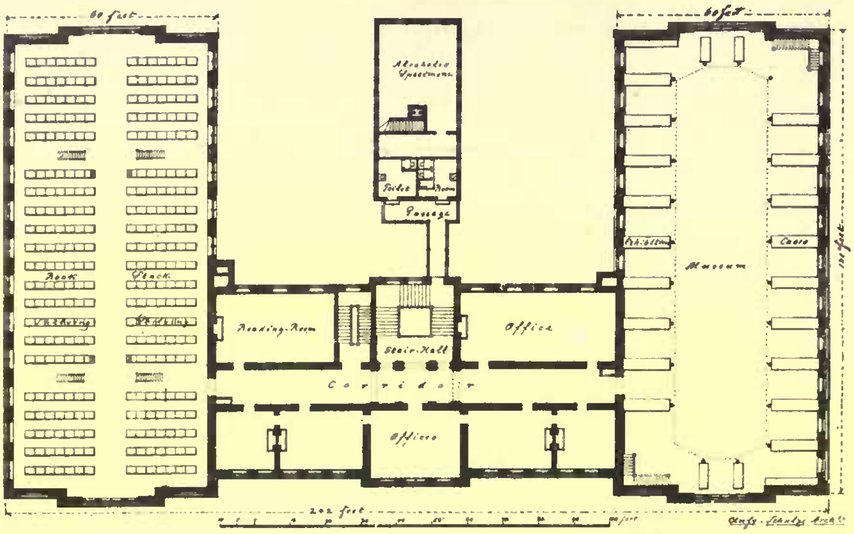
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ABBEY CHURCH OF THE HOLY TRINITY, CAEN.

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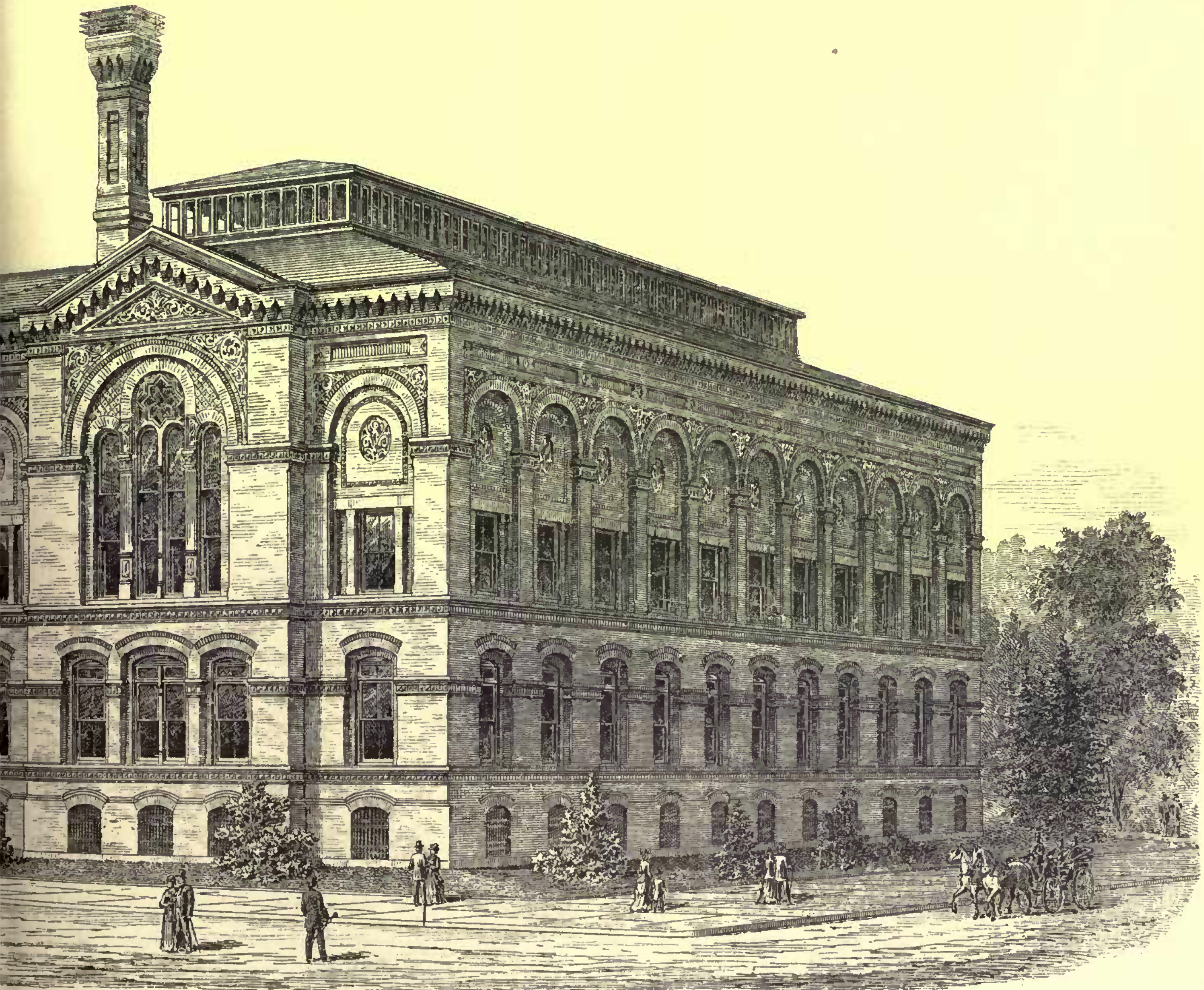
Second Story Plan of Medical Museum - Library - Building, U. S. Army.
Washington, Nov. 1885.



MEDICAL LIBRARY

Washin

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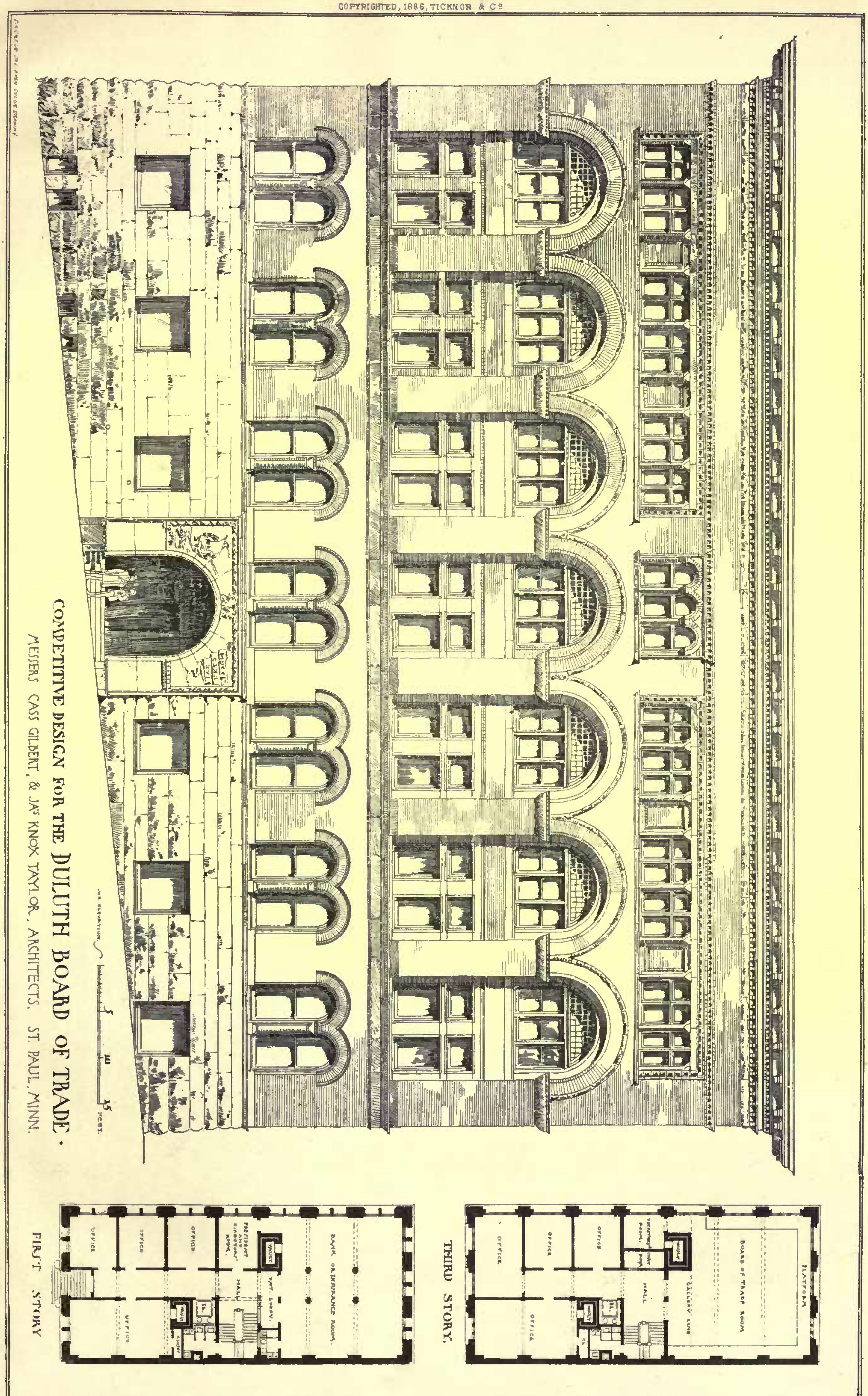
MUSEUM, U.S. ARMY.

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Cluss & Schulze, Archts.

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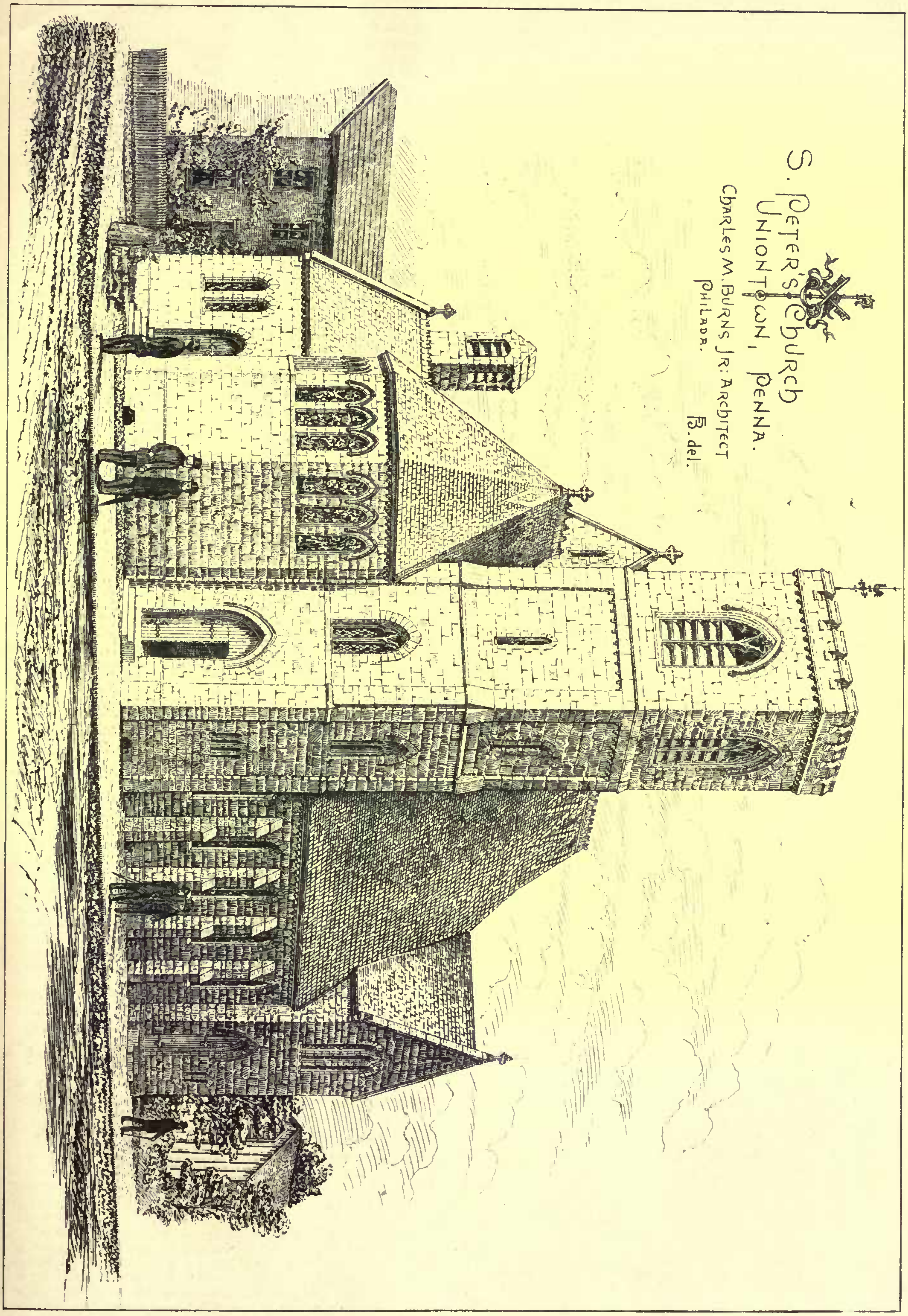
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COMPETITIVE DESIGN FOR THE DULUTH BOARD OF TRADE ·
MESSERS CASS GILBERT, & JAS KNOX TAYLOR, ARCHITECTS. ST. PAUL, MINN.

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buttons below marked "*gallerie links*," "*parquet*," "*erste rang*," etc. On pressing a button, a number appears before one of the discs, representing the exact temperature of the particular portion of the house designated by the button pressed. The *control zimmer* is also supplied with registering anemometers, hygrometers, steam and water guages, fire-signals and electric call-bells connected with nearly every portion of the house; so that one man here, with an assistant in the steam-distributing room, and another in the mixing-chambers, has practically an absolute control of the heating and ventilating of the entire house. This idea is by no means new or exceptional, but it is carried out more perfectly than is usually the case in so large a building. But for that matter, thoroughness in detail is a marked feature of everything which has had to do with the planning of this house.

One very ingenious and at times very convenient device made use of, is a thermo-electric indicator placed outside the principal entrance, and connected with the interior in such a manner as always to show to whoever may wish to know the exact temperature of the auditorium. It seems almost like a public guaranty that the room shall not become overheated.

The writer was unable to make any personal tests of the efficiency of the system of heating and ventilation, but it would seem that where so little is left to hazard, or to the natural movement of the air, and where such complete control is maintained over the whole, there can be but slight chances for anything like failure.

C. H. BLACKALL.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

ST. PETER'S CHURCH, UNIONTOWN, PA. MR. C. M. BURNS, JR., ARCHITECT, PHILADELPHIA, PA.

THE architecture is English Gothic of the fourteenth century. The nave of the church is forty feet by fifty feet, and will seat three hundred. The chancel is twenty feet by eighteen feet six inches. The Sunday-school rooms, in the rear, are forty-five feet by fifteen feet, and of two stories, and will accommodate comfortably about seventy-five on each floor. The church has an open-timber roof carried on six hammer-beam trusses; the rafters and purlins divide up the ceiling into panels of diagonal boarding, of North Carolina yellow pine. The roof is covered with slate laid to a pattern, in three colors, and the ridge is surmounted with a red terra-cotta cresting. The apex of the chancel roof has also a terra-cotta cross. There are four stone crosses at different points of the roof and gables. The building consists of a nave of five bays, with apsidal chancel of three bays. The angle formed by the nave and chancel on the north-east is occupied by the tower, and that on the south-east by the organ-chamber and vestry-room. The tower is constructed in four stages, the first one forming the church porch, the second, the bell-ringer's, and the third, the belfry. At the west of the nave the parish building occupies the entire width of the lot, extending westward toward the alley. The entire building is of stone. The woodwork throughout is of North Carolina yellow pine, finished in oil, except the pews, which are of chestnut, second growth, with oil finish. The subscription account of the Building Committee shows, in round numbers, $11,300 collected and paid. This represents the amount paid to the architect, $350, and to the builders, as well as the cost of the pavement and part of the heating apparatus, etc. To this add the cost of the windows, $2,100; tiling, $640; chancel furniture, $725; other furniture, etc., $150; probable cost of the bell, $300; cost of organ, $1,825; making a total of $17,050.

THE UNITED STATES ARMY MEDICAL MUSEUM AND LIBRARY, WASHINGTON, D.C. MESSRS. CLUSS & SCHULTZE, ARCHITECTS, WASHINGTON, D.C.

CONGRESS has appropriated $200,000 for erecting, complete for occupancy, a fire-proof building for the library, pension records, and museum of the Surgeon General's Office, United States Army. The estimates for a building, limited to the space absolutely required, and devoid of expensive exterior and interior architecture, had been from $250,000 to $300,000. Under these circumstances the Building Commission, presided over by the Secretary of War, decided that the feasibility of the scheme must be conclusively shown by a bonded contract based upon detailed drawings and specifications before the work could be allowed to proceed; hence anything involving avoidable expense was ruled out from the architect's designs.

Details of Construction: — Concrete foundations. Exterior walls of bricks with a bonded internal lining of hollow bricks; cornices, spandrels, tympanums, of pressed bricks and terra-cotta; partitions of solid and hollow bricks; floors and roofs formed of flat arches built of hollow bricks between rolled beams, with terra-cotta protections for girders and beams; columns of fire-proof sectional wrought iron; corridors floored with encaustic tiles; halls with Portland cement; offices with wood on concrete; stairs of iron; stoops, base-course, sill-courses, and miscellaneous blocks of rubbed Graywecke bluestone; library and museum constructed as independent compartments; heating by low-pressure steam, mostly with indirect radiation, besides open fire-places with mantles and grates; ventilation by steam-heated aspiration-shafts; water-closets, laboratories and alcoholic specimens strictly separate in the wing inside the court-yard.

Available Floor Space in Square Feet. — Basement 21,400, offices 33,600, museum 11,270, book-stack 20,800 (capacity 320,000 volumes); and besides 4,200 square feet in the small yard wing which, with 60,000 cubic feet contents, is not included in the building contract.

The basement of the building constitutes mainly one vast reservoir for fresh air, and by including but one-half the contents of this, the building measures 1,342,500 cubic feet of space under roof. The contract price, including steam-fitting, is $179,987, which gives the low rate of thirteen-and-four-tenths cents per cubic foot, which leaves funds to pay for plans and supervision, and besides a small balance towards the erection of the wing in the yard.

This edifice is located at the southeast corner of, and *with the rear* abutting on the Smithsonian Grounds, because before long it must be extended by a main-front facing the public grounds, when the present front will assume its place as the rear elevation of the building. The present Congress will no doubt grant the moderate estimates for the iron frames and shelving of the book-stacks and cases for the pension-records and the exhibition-cases of the museum, so that the furnishing will be almost simultaneously completed with the construction of the building.

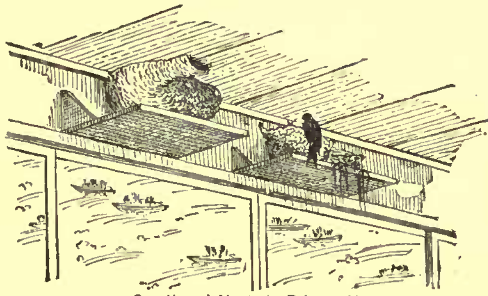
CHURCH OF THE HOLY TRINITY, CAEN, FRANCE.[1]

SECTIONAL VIEW OF THE OPERA HOUSE, FRANKFORT-ON-THE-MAIN, GERMANY.

FOR description, see article elsewhere in this issue.

COMPETITION DESIGN FOR THE BOARD OF TRADE BUILDING, DULUTH, MINN. MESSRS. GILBERT & TAYLOR, ARCHITECTS, ST. PAUL, MINN.

JAPANESE HOMES AND THEIR SURROUNDINGS.[2]—II.



Swallows' Nests in Private House.

AS further indication of the interesting character of Professor Morse's book, we quote the following fragments, which give some account of certain domestic habits: —

A HOUSEHOLD shrine, to which the children pay voluntary and natural devotion, is the birds' nests built within the house. It is a common thing, not only in the country but in large cities like Tokio, for a species of swallow, hardly to be distinguished from the European species, to build its nest in the house — not in an out-of-the-way place, but in the room where the family may be most actively engaged, or in the shop fronting the street, with all its busy traffic going on. The very common occurrence of these birds' nests in houses is another of the many evidences of the gentle ways of this people, and of the kindness shown by them to animals.

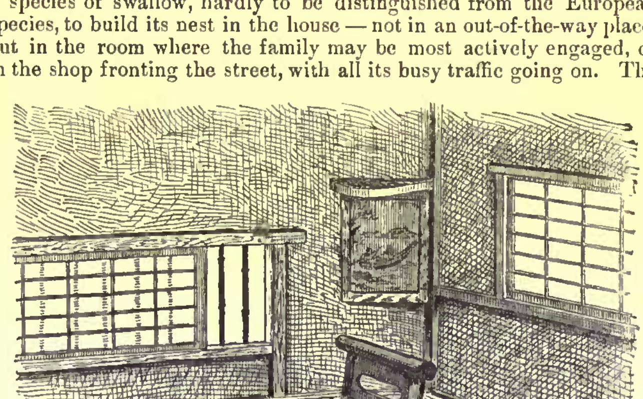


Figure 1. Interior of a Privy in Asahusa.

[1] From Cotman's "*Antiquities of Normandy*."

[2] "*Japanese Homes and their Surroundings*" by Edward S. Morse, late Professor of Zoology, University of Tokio, Japan; with illustrations by the Author. Ticknor & Co. 1886. Continued from No. 523, Page 4.

When a bird builds its nest in the house, a little shelf is promptly secured beneath it, so that the mats below shall not be soiled. The presence of the bird in the house is regarded as a good omen, and the children take great pleasure in watching the construction of the nest and the final rearing of the young birds. I noticed that many of the nests built within the house were much more elaborately made than those built in more exposed positions. From the symmetrical way in which many of these were constructed, one might almost imagine the birds had become imbued with some of the art instincts of the people. The initial cut illustrates the appearance of a group of these birds' nests in a house.

It would be an affectation of false delicacy were no allusion to be made to the privy, which in the Japanese house often receives a share of the artistic workman's attention. From its position in the public house, and especially in the public house, it is often a source of great discomfort. In the better class of private houses in Japan, however, there is less annoyance and infinitely less danger from this source than is experienced in many houses of the wealthy in our great cities. In the country the privy is usually a little box-like affair removed from the house, the entrance closed half-way up by a swinging-door. In the city house of the better class it is at one corner of the house, usually at the end of the veranda, and sometimes there are two at diagonal corners, as a reference to the plans will show. A curious superstition among many is attached to the position of the privy in its relation to the house—a trace, possibly, of the Chinese *Fun-shui.* The privy generally has two compartments, the first one having a wooden or porcelain urinal — the latter form being called *asagaowa*, as it is supposed to resemble the flower of the morning-glory, the word literally meaning "morning face." The wooden ones are often filled with branches of spruce, which are frequently replenished. The inner compartment has a rectangular opening cut in the floor, and in the better class of privies this is provided with a cover having a long wooden handle. The woodwork about this opening is sometimes lacquered. Straw sandals or wooden clogs are often provided to be worn in this place.

The interior of these apartments is usually simple, though sometimes presenting marvels of cabinet-work. Much skill and taste are often displayed in the approaches and exterior finish of these places.

Figure 2 illustrates the appearance of a privy in an inn at Hachi-ishi, near Nikko. The planking in the front of the sketch shows the veranda; from this, at right angles, runs a narrow platform, having for its border the natural trunk of a tree; the corner of a little cupboard is seen at the left; the ceiling is composed of matting made of thin strips of wood, and below is a dado of bamboo. The opening to the first apartment is framed by a twisted grape-vine, while other sticks in their natural condition make up the framework. Beyond the arched opening is another one closed by a swinging-door; and this is usually the only place in the house where one finds a hinged door, except, perhaps, on the tall closet under the kitchen stairs. The roof is covered thickly with the diminutive shingles already alluded to. Outside a little screen fence is built, a few plants neatly trained below, and a typical privy of the better class is shown. The wooden trough standing on four legs and holding a bucket of water and a wash-basin is evidently an addition for the convenience of foreign guests. The *chōdzu-bachi*, with towel-rack suspended above, as already described, is the universal accompaniment of this place.

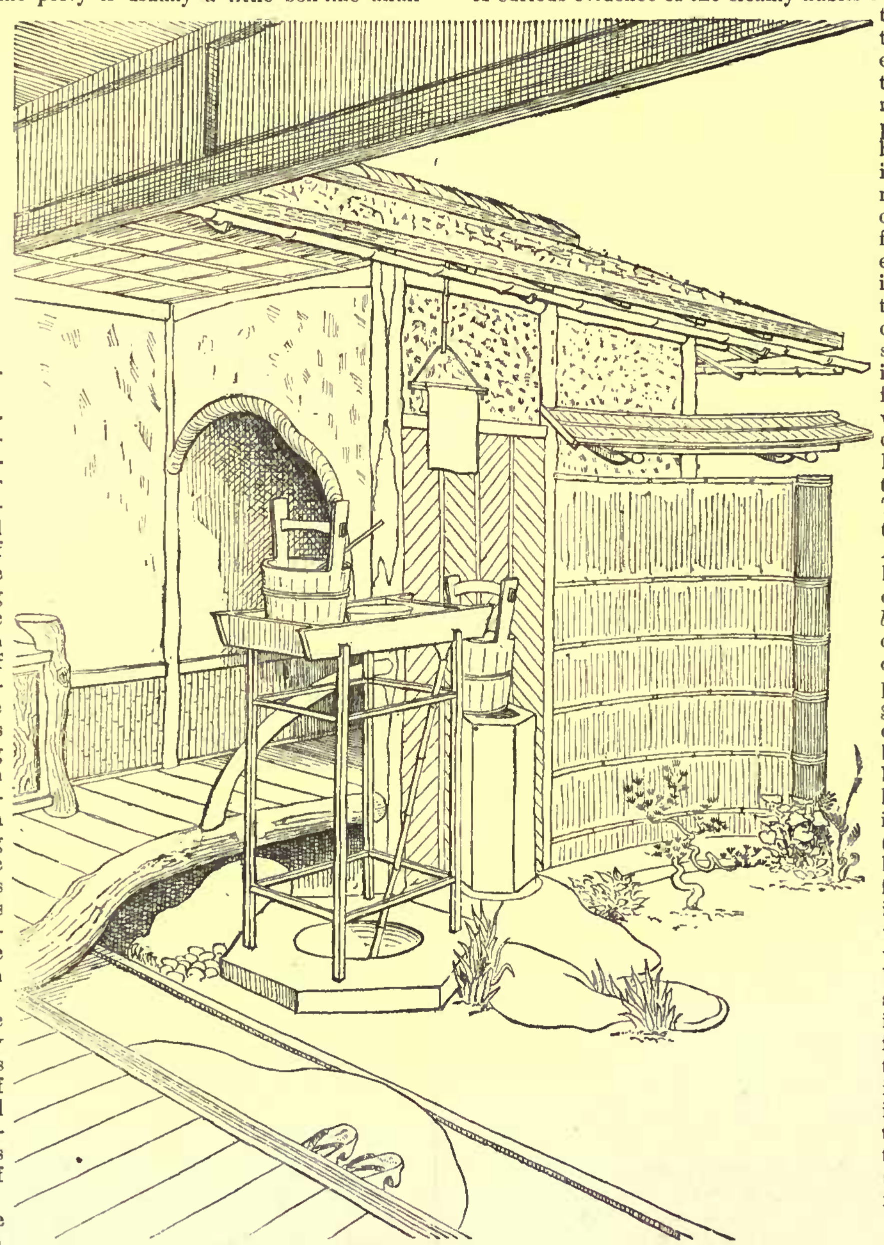


Figure 2. Privy of Inn, in Hachi-ishi Village, Nikko.

As one studies this sketch, made at an inn in a country village, let him in all justice recall similar conveniences in many of the country villages of Christendom!

The receptacle in the privy consists of a half of an oil-barrel, or a large earthen vessel, sunk in the ground, with convenient access to it from the outside. This is emptied every few days by men who have their regular routes; and as an illustration of the value of this material for agricultural purposes, I was told that in Hiroshima in the renting of the poorer tenement-houses, if three persons occupied a room together the sewage paid the rent of one, and if five occupied the same room, no rent was charged! Indeed, the immense value and importance of this material is so great to the Japanese farmer, who depends entirely upon it for the enrichment of his soil, that in the country personal conveniences for travellers are always arranged by the side of the road, in the shape of buckets or half-barrels sunk in the ground.

A curious evidence of the cleanly habits of the Japanese is seen in the *chōdzu-bachi*, a receptacle for water at the end of the veranda near the latrine. This convenience is solely for the purpose of washing the hands. This receptacle, if of bronze or pottery, rests on a stand or post of some kind, which rises from the ground near the edge of the veranda. Its importance is shown by the ornamental features often displayed in its structure and surroundings. In its simplest form it consists of a wooden bucket suspended by a bamboo which hangs from the eaves of the veranda roof above. To this bamboo hangs the dipper also (Fig. 4). A towel-rack usually hangs near by. A more common form of *chōdzu-bachi* consists of a vessel of bronze, pottery or porcelain, supported by a post fixed firmly in the ground, around the base of which is strewn a number of beach-worn pebbles, intermingled with larger stones; so that in washing the hands (which is always done by dipping the water from the vessel and pouring it on the hands) the water spilled finds its way through the pebbles, and thus an unsightly puddle of water is avoided. In simple forms of *chōdzu-bachi* the pebbles are enclosed in a frame of tiles fixed in the ground edgewise, this frame being sometimes triangular and sometimes circular in form.

For a support to these vessels the quaintest devices come into play: it may be the trunk of a tree, from one side of which a branch springs, covered with leaves and blossoms; or it may be the end of a carved post from some old building. A favorite support consists of a rudder-post from some old ship-wreck, as at a gentleman's house in the suburbs of Tokio. Usually the vessel is of bronze, and one often notices rare old forms used for this purpose, covered with a rich patina. Oftentimes water is conducted by a bamboo pipe, to fall in a continuous stream among the pebbles.

Many forms of *chōdzu-bachi* are in the shape of ponderous, thick blocks of stone, with a depression on the top to hold the water. Of the stone forms there is an infinite variety: it may be a rough-hewn stone, or a square post, or an arch of stone, with a depression for water at the crown of the arch; indeed, the oddest conceits are shown in the designs for this purpose. The usual form, however, is cylindrical; the stone may be wrought in the shape of an

urn. Whatever the form, however, they are generally monoliths. Usually the stone *chōdzu-bachi* has a little wooden frame-work with roof resting on the top, to keep dead leaves from falling into the

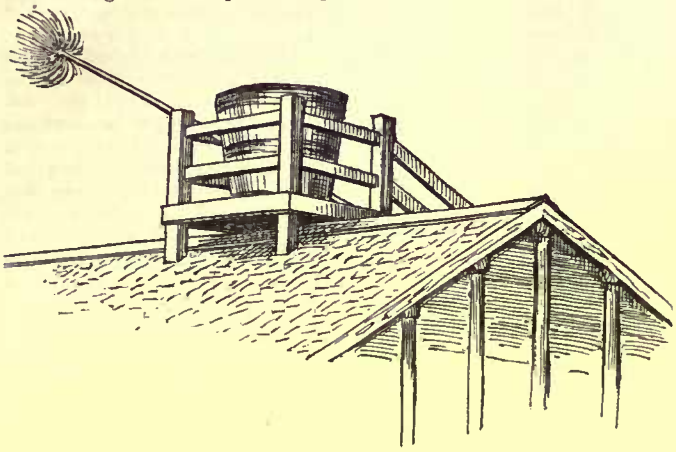


Figure 3. Staging on House-roof, with Bucket and Brush.

water. Large, irregular-shaped stones, having depressions in them for water, may be seen near the entrance of the little buildings used for the ceremonial tea-parties; in this case the stone rests directly upon the ground.

While in most cases the *chōdzu-bachi* is but slightly removed from the edge of the veranda, so that one may easily reach it with the dipper which always rests upon the top of the vessels; in more elaborate surroundings a little platform called *hisashi-yen* is built out from the edge of the veranda. This platform has a floor of bamboo rods, or circular or hexagonal bars of wood. A hand-rail often borders this platform, and a quaint old iron lantern usually hangs from above, to light the *chōdzu-bachi* at night.

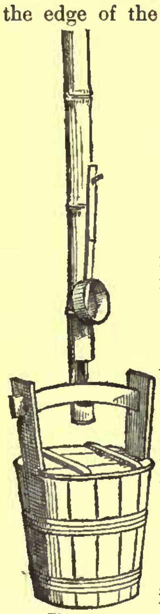


Figure 4. Chodzu-bachi.

In the cities and large villages the people stand in constant fear of conflagrations. Almost every month they are reminded of the instability of the ground they rest upon by tremors and slight shocks, which may be the precursors of destructive earthquakes, usually accompanied by conflagrations infinitely more disastrous. Allusion has been made to the little portable engines with which houses are furnished. In the city house one may notice a little platform or staging, with handrail, erected on the ridge of the roof; a ladder or flight of steps leads to this staging, and on alarms of fire anxious faces may be seen peering from these lookouts in he direction of the burning buildings. It is usual to have resting on the platform a huge bucket or half-barrel filled with water, and near by a long-handled brush; and this is used to sprinkle water on places threatened by the sparks and fire-brands which often fill the air in times of great conflagrations.

During the prevalence of a high wind it is a common sight to see the small dealers packing their goods in large baskets and square cloths to tie up ready to transport in case of fire. At such times the windows and doors of the *kura* are closed and the chinks plastered with mud, which is always at hand either under a platform near the door or in a large earthen jar near the openings. In private dwellings, too, at times of possible danger, the more precious objects are packed up in a square basket-like box, having straps attached to it, so that it can easily be transported on one's shoulders.

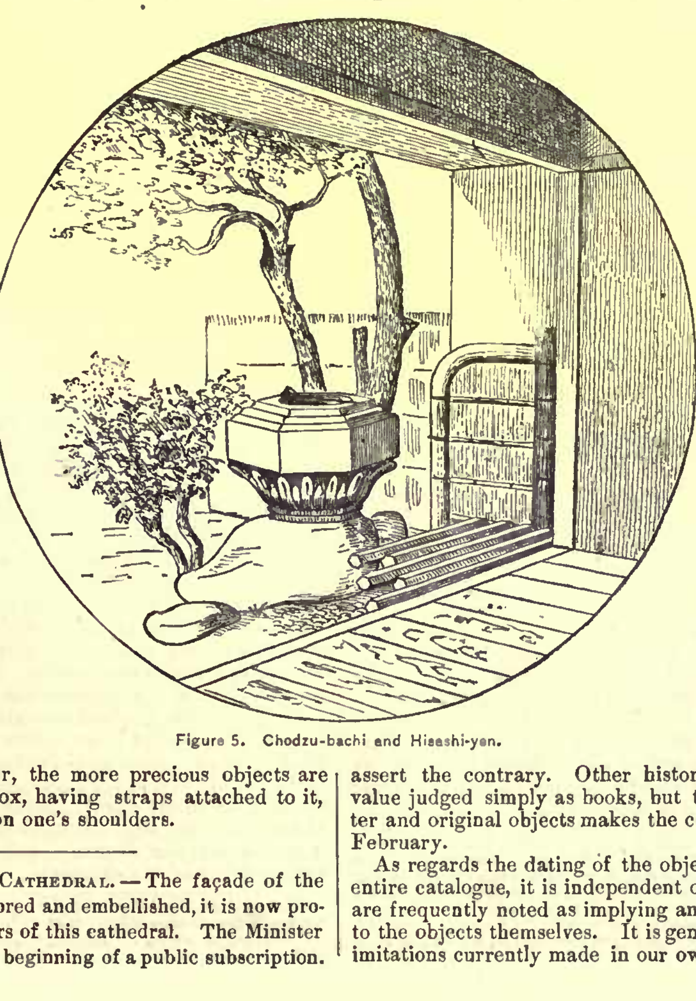


Figure 5. Chodzu-bachi and Hisashi-yen.

BRONZE DOORS FOR FLORENCE CATHEDRAL. — The façade of the Duomo in Florence having been restored and embellished, it is now proposed to cast in bronze the great doors of this cathedral. The Minister of Public Works offers $1,000 for the beginning of a public subscription.

THE BRINKLEY COLLECTION.



THE ninth of February will witness the dispersal of a series of Oriental porcelains of great interest to those wishing to inform themselves on the history of this subject. This dispersal is beyond repair, as more than one-half the collection has been sold in the last few weeks, and the date fixed is the one for the delivery of these pieces and of the others which may be meantime disposed of. Historical interest in Oriental art is not as wide-spread as that of the amateur and the decorator, and is apt to be strong in inverse ratio to the wealth of the person professing it; students having a notorious mania for poverty, therefore the hint to this class to see the said collection may not be of great value to the vendor. But the Brinkley Collection was not made for a mercenary purpose — hence this notice.

Captain Brinkley, originally an English officer of the Royal Artillery, has been in Japanese Government employ during and since the revolution of 1871. He has written a history of Oriental ceramics, soon to be published, of which one may very fairly judge by the extracts contained in the catalogue of the collection. These extracts are probably more valuable now than the entire book will be after the collection made to illustrate it is dispersed, as they may be directly related to each separate class of objects in question, and studied in connection with them. With both and the collection the interest lies in the Oriental standpoint and Oriental affiliations of the writer. We are not dealing with a Western taste applied to Eastern objects, as is usual with the most valuable collections made in Europe and America, and as is universal with collections of objects made in Japan or China for purposes of export. On the contrary, the object of the collector and the writer (one and the same person) has been to show what is admired and treasured *in Japan* — judging, that is, by the extracts from his book and the description of the objects to which they draw attention.

The subject of Oriental ceramics is known to be a labyrinth of fraud and of self-deception, of counterfeits and of ignorant criticism, in which the personal taste of the individual artistic temperament is generally assumed to be the only guide. The catalogues of the auctioneers are strewn with attributions of "Ming," "Kang-he," and "Keen-lung," which are notoriously entered at random, or based on "marks" which are notoriously not a safe standard of date. To such an extent does the resulting distrust extend that the catalogues of public institutions have gone to the extreme of generally ignoring the question of dates, and of virtually asserting by implication that a history of the subject is impossible. For the literary history which such catalogues contain, the Bethnal Green (South Kensington) catalogue of the Franks collection, or the porcelain catalogue of the Metropolitan Museum of Art in New York, is of no great value unless it can be connected with historically arranged and dated pieces. And so with the Audsley-Bowes "*Ceramic Arts of Japan*," which offers an entire volume of colored illustrations and another volume devoted to the literary history of the subject, there is no attribution of dates in connection with individual pieces. The "*L'Art Japonais*" of M. Louis Gonse is too sparsely illustrated to make the attribution of periods connected with the illustration available for comparative study. Moreover, the study of books separate from the study of the objects is nowhere so useless as in the case of porcelains, since the distinction of originals from imitations is dependent on delicate refinements in the material, or in the design, which can only be observed in the original objects. This explains the immediate value of the Brinkley Collection and its attendant catalogue. Other collections may very possibly be superior in the case of many individual pieces; at least it does not lie in our power or intention to assert the contrary. Other historians may have an equal literary value judged simply as books, but the juxtaposition of literary matter and original objects makes the collection unique until the ninth of February.

As regards the dating of the objects, which is carried through the entire catalogue, it is independent of the marks of the pieces, which are frequently noted as implying an earlier date than that attributed to the objects themselves. It is generally known that aside from the imitations currently made in our own time, the ancient porcelains of

China were very successfully imitated during the eighteenth-century period in China. This gives an especial value to the Chinese series, which has been collected in Japan from owners in whose families the Chinese porcelains had been heirlooms, and consequently owe their attributions of date as well to family tradition as to internal evidence of style and execution. For comparative study of Chinese and Japanese art the collection is especially valuable, since it is divided in two nearly equal portions for China and Japan respectively. It is true that as far as the Chinese porcelains are concerned they show only what has been admired in Japan, but the Japanese art owes its inspiration and originals to China and the Japanese experts are foremost in admitting this dependence and their own inferiority in important particulars; hence it appears that as Orientals they have followed the Chinese taste in the choice and estimation of Chinese pieces.

An important aspect of the Oriental porcelains is their intimate relation to the Oriental civilization. The "Tea Clubs" of Japan have been the æsthetic and aristocratic centres of the country. Hence a passion for the patronage of porcelain manufacture and the collection of the works of celebrated makers. These have been handed down in the families owning them from one generation to another, until the social revolution of 1871 occasioned the partial dispersion of these collections from which the one in question has been formed. In a nation where the point of honor has been frequently carried to the extreme of suicide, it is not likely that the collectors and experts of the Japanese nobility have been guilty of deception or misrepresentation as to the traditional history of individual pieces of china. As distinct from the Chinese they have made themselves accessible to foreign acquaintance, and being in search of other knowledge for themselves have been willing to impart their own. It is to Oriental experts that those of the West must owe their cultivation and the foundation of their Oriental studies, and at present rather to those of Japan than of China, for obvious reasons. In Captain Brinkley's history and catalogue the name of Ninegava Noritané frequently appears as original owner or authority. A similar distinction has been awarded this expert in the catalogue of the supplementary portion of the Franks Collection of the Bethnal Green (South Kensington) Branch Museum. In the leading work on Japanese art in general —"*L'Art Japonais*"— we read that an ancient temple treasure of art objects dating from the eighth century is inspected once in sixty years, by a committee of five Japanese experts, and that it is again secluded for another like period for greater security of preservation. In this connection the name of Ninegava Noritané once more figures as an expert honored by the Japanese Government with the leading place on the last committee of 1875. In the Brinkley Collection we are evidently then as near the fountain head of information on the History of Oriental Art, as, in default of more intimate relations with China, it is at present possible for a Westerner to come.[1]

WM. HENRY GOODYEAR.

BOOKS AND PAPERS

ABOUT this time Messrs. Cassell & Co. will begin the publication of a series of volumes to be issued weekly under the editorship of Henry Morley, LL. D., Professor of English Literature at University College, London.

These volumes will represent all periods and form of thought—history, biography, religion and philosophy; discovery and enterprise; plays, poems and tales; natural science and natural history; art; political economy, with whatever else may be worth lasting remembrance. Professor Morley is not only responsible for the selections in the series, but he will write an introduction to each number. These volumes, which will follow each other at intervals of a week, will consist of reprints of the best literature, and the first issue will be "*Warren Hastings*," by Lord Macaulay, which will be followed by Isaac Walton's "*Complete Angler*," Lord Byron's "*Childe Harold*," and the autobiography of Benjamin Franklin. Among the other books to be issued in this series are Gilbert White's "*Natural History of Selborne*," Martin Luther's "*Table Talk*," Sheridan's "*The School for Scandal*" and "*The Rivals*," Hillam's "*History of Europe during the Middle Ages*"; indeed there are few classics that will not find their way into this omniverous library. Perhaps the best feature of Cassell's "*National Library*" will be its remarkably low price. The volumes will be small octavos of about one hundred and ninety-two pages, printed in clear, readable type, on good paper, and sold for ten cents each, or fifty-two volumes, postpaid, for five dollars, when subscribed for by the year. Nothing but the belief that there is a large audience waiting for just such literature at just such a price would make it a feasible undertaking, for the profit is necessarily small. The publishers, however, are not unmoved by philanthropic motives, and if this is the age of cheap books, they propose to do their part not only toward making cheap books, but in putting the best literature within the reach of the million.

[1] The Brinkley Collection is now on view at the Art Gallery of Mr. Edward Greey, 20 East Seventeenth St., New York City. This gentleman is known as the author of various translations from the Japanese. When the Collection was exhibited in Boston, it lacked the historical catalogue, and consequently the interest which it claims at present. The enterprise and good sense of the present owner secured the MS. History of Japanese Keramics, by Captain Brinkley, and therewith the ability to prepare the catalogue now issued, which has been revised by the original author and collector.

WE have looked for the appearance of *Building* in its new form with much interest and no little curiosity, mainly because we have so often been given to understand that we were the victims of grave misfortune in having our birthplace and home in a provincial city, rather than in the metropolis of the country. There is a good deal in this, and we have always felt that we had to contend with obstacles which do not interfere with the development and great usefulness of the metropolitan journals of London, and we have often envied their editors because of the ease of access they had to the great mass of the profession, to say nothing of the artistic life which centres all around them, within their easy reach. It is this more than anything else that must always, we feel, make the London journals superior to any that can be published in this country—at least until our cities and art centres expand to some degree of equivalency. And now our envy is in a manner transferred against the editor of *Building*. Notwithstanding this unavoidable frame of mind, as we trust his capacity in certain directions, we trust that we shall observe that he is awake to his opportunities, and able to take full advantage of them. Of the journal itself we can only say that it is not dissimilar to its original form in the character of its contents, while it is greatly improved by being reduced to a more manageable and agreeable form.

ONE may receive considerable amusement and instruction while listlessly turning over the pages of "*King's Hand-Book of Boston*,"[2] from its many illustrations which, inferior in execution as many of them are—though they are better than are usually found in hand-books—serve to revive memories and recall external features which the busy man has long since forgotten to observe. Certain buildings there are, which, thanks to their position either at the end of a vista, as the Boston & Providence railroad station, or as isolated structures like the buildings about Copley Square, are familiar to all as works of architecture, and are as such noticed by even the busiest passer-by. But there are many other buildings which are less often noticed, buildings which in fact make up the real Boston, and stamp it as a city which, as a whole, makes more impression on the casual sojourner than, perhaps, any other in the country. What busy frequenter of State Street ever stops to consider the merits of the Custom-House or the Merchant's Exchange in the matter of architectural design? Most men are thinking more of reaching the elevator in the shortest time, than of stopping to crane their necks in our narrow streets in an endeavor to take in the treatment of the upper part of the façade behind which they are hurrying to hide themselves. And yet should one go leisurely about with this guide-book in hand he would acquire new impressions of his surroundings, and would find those of his youthful days pleasantly refreshed. He would find enough left of the "swell-front" to stamp this as the feature *par excellence* of Boston domestic architecture. He would find as he stood before Mount Vernon Church in Ashburton Place that, logically absurd as words can make it appear, it takes more than words to destroy the impressiveness of the Greek temple façade: though as he passes the Tremont House he will notice that there is a way, more effectual than words, of making the work of our forbears a laughing stock in the market-place.

The book is full of facts interesting to stranger and resident alike, which Mr. King, has spared no pains to make absolutely reliable.

AN admirable complement of this hand-book is a collection of a dozen or more heliotype views[3] of some of the isolated buildings we speak of above, brought together into the form of a very attractive "souvenir." Here are illustrations which tell the true story of their originals without falsifying or concealment, and show the tourist what he may expect to see when he makes a pilgrimage to the "show" buildings of Boston. It would seem as if, in these days of easy and rapid locomotion, it would pay some enterprising publisher to get out a similar souvenir for a score or more of the chief cities of the country.

IN place of getting out one large holiday number, the publishers of *L'Art* divide their efforts between two numbers of equal merit, but of unequal interest from our point of view, for we find nothing in the second number to balance M. Max. Collignon's article on the frieze of the Parthenon which appears in the first. This article is in the first place illustrated by four or five of the most admirable phototypic illustrations of fragments of the frieze that we have yet seen, and which seem to show that in this particular form of process-cut the Parisians have no superiors, unless it be the Viennese.

Every one who studies this famous piece of sculpture sheltered within the porticos of the Parthenon gives to it his own interpretation, just as each one seeks a new explanation of the vexed question of how the temple was roofed. M. Collignon relates that the sculpture represents the processional portion of the ceremony which attended the enduing of the wooden statue of Athena Polias with a new peplos at the end of every fourth year. The days of festivities have been passed in games and feasts, and the populace in gala attire have turned out to join in the closing ceremonial, the young men who have taken part in the hippic games have not yet been able to subdue either their own high spirits or the restiveness of their horses which accounts for the disarray which at places interrupts the formal arrangement of the cavalcade. The interpretation of the features

[2] "*King's Hand-Book of Boston.*" Seventh edition revised and enlarged: Cambridge, Mass: Moses King. 1886.

[3] "*Heliotype Views of Boston.*" Heliotype Printing Company, Publishers. Price, $1.00.

of the procession indicated in the frieze have rather an archæological and ethnological than an artistic interest, so we will not undertake to follow them. Of more interest is the stress that is laid on the fact that this is the conception of Phidias, and its very departure from precedent show the preëminence of the master's genius. Another than Phidias would have made the procession turn about the building without beginning or end. He took as his starting point the southwest angle of the building, and sent his marble hosts in stately yet vivacious columns up either side to debouch at the front upon the symbolic group of deities. Instead of representing the procession in all its parts with due apportioning of space to each of the component elements, it was his artistic perception that knew how to seize on the salient features and combine them into a coherent whole. It is pointed out that much of the actual work was done by different pupils of Phidias, and it is said to be easy to discover upon which portions the less skilful were employed. M. Collignon makes one curious observation; he says: "In Greece more than elsewhere, industrial art takes its inspiration from high art and reflects its characteristics. The popularity of a master can be measured by the influence he exercises over the work of artists of low rank and the most modest talents, those who carve the funeral monuments, the votive bas-reliefs, the crowning feature of the stiles, the simple marble-workers in a word. It is not open to doubt that the frieze of the Parthenon contributed in a large degree to elevate the standard of industrial art."

SOCIETIES

BOSTON SOCIETY OF ARCHITECTS.

AT the last regular meeting of the Boston Society of Architects, held on Friday evening, January 8, the following report was unanimously accepted: —

The committee appointed at the November meeting of the Boston Society of Architects, to consider what action, if any, shall be taken respecting the late Court-House competition, beg to submit the following report: —

BOSTON, January 8, 1886.

Competitions for public buildings are presumably instituted to promote the best interests of the public. Upon general principles it is safe to say that a course of procedure best adapted to this end will not be found to be prejudicial to the interests of the profession.

The terms of the late court-house competition were calculated to inspire both the public and the architects with confidence. They were briefly these: —

1. A preliminary unpaid competition, with sketches at a small scale, from which a selection was to be made with the assistance of an expert, of not more than ten of the plans showing the greatest capacity for dealing with the problem.

2. A final competition by the authors of the selected plans, who were to be paid one thousand dollars for the final drawings.

In this double competition lay the whole excellence of the scheme, and its whole attractiveness in the eyes of the profession. For the preliminary drawings a comparatively short time was allowed. The ideas of the competitors were to be expressed as simply and forcibly as possible, but there was no opportunity for prolonged study or careful elaboration in detail, either of plans or elevations. These were reserved for the second and final struggle.

The Commissioners found among the plans submitted in the first or preliminary competition, one whose author had been for years, as a necessary part of his official duty as City Architect, in contact with the court-house problem, who had been in frequent conference with committees of the City Government having the matter in charge, and with the various official persons and members of the legal profession, whose personal wishes were to be met — who had been consulted by the Commissioners while the site for the building was being determined, and who was thus to an extraordinary degree familiar with the special requirements of the case.

The sketches submitted by this gentleman were, it is to be presumed, the best he could offer after such ample preparation. The other sketches were but the first impressions of their authors, upon the first consideration of the problem. It is not reasonable to suppose that such sketches, necessarily imperfect and incomplete as they were, and presented after such study only as busy men could give to a very complicated and important project in the few weeks allowed, embodied in any instance the best result which its author might be expected to reach under the more favorable conditions of a second competition, with ampler time for study and the stimulus of success in the first. And to say that, had the scheme of the commission been carried out as proposed, nothing could have resulted from the second competition better in a practical or artistic sense than the plan which the commissioners selected from the first, is an assumption that cannot be justified.

It is therefore *Resolved*, That the Boston Society of Architects regrets the action of the Commissioners of the Suffolk County Court-House, in awarding the commission as architect of the building upon the result of the preliminary competition, and not upon that of the second and final one proposed by the programme.

1. Because a precedent is thereby established which must tend still further to discourage architects of the best standing from entering upon competitions in the future.

2. Because the public has been deprived of the results which might reasonably have been expected from the more prolonged and serious study of the selected competitors.

EDMUND M. WHEELWRIGHT,
Secretary Boston Society of Architects.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

THE COMMON-SENSE LUMBER-DRYER.

EAST WHATELY, MASS., January 11, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,—We wrote you January 7th as follows: In your edition of December 19, 1885, No. 521, you give a description of "Common-Sense Timber-Dryer" (page 290). Will you inform us whom we can write to for further information? We wish to know who are the manufacturers of the drying kiln, and if you do not know this, will you let us know what number to call for of the *Builder;* also where we can get the *Builder*, and price to send for it?

As we do not hear from you, we take the liberty to send you a card, and we would like to have you let us know, of the *Builder*, what number to call for, also some stationer, or agent, who sells these papers, as we do not know where the paper is published.

Yours truly, BARTLETT BROTHERS.

[WE have written to the manager of the only dry-house of the kind in this vicinity, that we know the exact location of, but have received no answer. Perhaps some of our readers can tell us more about the subject. The *Builder* (English) referring to what seems to be the same thing is No. 2234 [?], and can be ordered of Brentano, Union Square, New York, or Cupples, Upham & Co., Boston. It is worth while to call the attention of those interested to the fact, as illustrated both in this case and in a previous one, where we wrote in vain to the only person we knew who could tell anything about the wire stone-saw, that the ingenuity of inventors in devising improved processes and machinery is only surpassed by that which they seem to display in keeping those who would like to employ those processes and machinery from knowing where to get them. As to the complaint of neglect on our part which our correspondent makes, we desire to say that questions which may have interest to others than the asker can be answered only in our columns.—EDS. AMERICAN ARCHITECT.]

THE RIGHT OF AN ARCHITECT TO ABANDON HIS WORK.

NEW YORK, January 6th, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Will you kindly inform me if a client can oblige an architect to continue to act as such until the completion of the building, or has he the right to leave after due notice in writing, provided there is no contract, the architect merely stating at the beginning his charges are five per cent and travelling expenses, which includes everything? The client sending word through an outside party that he thinks the architect is in collusion with the builder at the very beginning of the work, and other such statements (for which there is no foundation), is the cause of the architect's wishing to leave.

Also, what would be the correct charge to make in case he left. By answering the above you will greatly oblige,

Yours, very truly, THE ARCHITECT.

[The architect, as we understand it, has no right to throw up his employment without good cause; and if he breaks his part of the agreement in this way he cannot hold the other party to the agreement to perform any part of his, unless some express stipulation has already been made upon the point. Of course a professional man is not bound to endure gross insults or injuries from his employer, and if compelled for this reason to terminate the relation he could probably collect what he had paid out, as well as a reasonable sum for his own time, measured by the number of hours he had actually devoted to the work; but a rumor, conveyed through an obliging third party, about what a client was alleged to have said to some one else about the architect, would, we think, be no excuse whatever for the latter's abandonment of his commission, and we do not think he could claim any payment from his client even for work which he had already done; while he would be liable for any damage caused to his client by his sudden withdrawal. In the present case we should imagine that about six words of quiet explanation between the architect and his client, not through the medium of a third party, would set everything right. The average client does not look upon collusion with the builder with half the horror that young architects feel for it; and if the architect has no intention of defrauding his employer, the latter will not think any worse of him for having been assured of the fact.—ED. AMERICAN ARCHITECT.]

TALL CHIMNEY CONSTRUCTION.

LONDON, ENGLAND, December 26, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Will you kindly allow me to ask if some of your readers will give particulars of the *tallest chimney-shaft in America?* Where it is situate, duty it has to perform, shape and style of architecture, cost; is it protected by lightning-conductors, etc. It would be interesting to many of your readers as well as myself. Hoping you will favor me by inserting this inquiry in your journal,

Yours faithfully, R. M. BANCROFT.

THE PROPOSED IRISH CANAL. — The proposed ship-canal across Ireland would be one hundred and twenty-seven miles in length, and would contain thirty locks. For ships of 1500 tons the cost would be $40,000,000; for ships of 2000 tons, $60,000,000; for ships of 5000 tons and upwards, $100,000,000. If built on this scale the canal would be two hundred feet wide on the surface and one hundred feet at the bottom. The passage through the canal would be effected by a system of towage, and it is estimated that the passage of a ship from Galway Bay to Kingston would occupy between twenty-four and thirty-six hours.

NOTES AND CLIPPINGS

Meissonier to paint a Fresco in the Pantheon. — It is said that Meissonier has accepted a commission to paint a fresco at the Panthéon, and has chosen for subject the encounter between Attila and St. Geneviève, the legendary patroness of Paris.

The Nature of the Accident to the Pont Neuf. — On the morning of December 17, about six o'clock, a serious accident was found to have occurred at the Pont Neuf, the oldest and best known of the Paris bridges. On that part of the structure crossing the narrower of the streams into which the Seine is divided by the island of the Cité, the third pier had sunk, and the pressure of the arches toward the subsidence had torn up the pavement of the footpaths and the causeway. An alarm was given by persons who were crossing the bridge, and traffic was at once stopped by the police. A large crowd soon collected and could see the outer stones of the bridge break off in large masses and fall into the river. Barriers were erected at both ends of the bridge and the gas-pipes crossing it were cut off and rendered secure.

It was found that the part of the bridge which had been injured had subsided sixty-five centimetres. That part of the bridge which crossed the wide stream is secure, but the other part will have to be entirely rebuilt. The city engineers state that the work will be long and tedious, and that while it is going on it will be necessary to erect a temporary bridge connecting the Quai des Orfèvres and the Quai des Grands Augustins. The common proverb "Solide comme le Pont Neuf," has thus been falsified. — *London Times.*

The Bower-Barff Process for Protecting Iron.—The Bower-Barff process for protecting iron from rust, by covering it with a skin of magnetic oxide of iron, appears to be steadily gaining in favor in Germany. It is not infrequently mentioned in German technical journals, and always with approval. Recently at a meeting of a branch of the German Engineers' Society, at Hanover, a paper was read by one of the members, in which he very strongly recommended the process to engineers and architects. Speaking of the fine blue-gray color of the coating formed, he said that this was always the more beautiful the cleaner the surface of the articles operated upon. The coating adheres very strongly to the metal, but still not so strongly as to allow of working iron so coated beyond a very limited extent. Thus wire cannot be bent without cracking-off the oxide formed on it. Therefore all articles to be protected should be finished before the oxidation takes place. As regards the strength of iron treated by the process, the results of experiments go to prove that wrought-iron does not in any way suffer by the oxidation, and that cast-iron gains in strength, inasmuch as the outer surface is to a considerable extent changed, and made like a malleable cast-iron, gaining in toughness. There is a gain in weight of about one-half of one per cent, owing to the oxidation, and a scarcely perceptible increase of volume. The protection is very perfect, as has been proved by burying test-pieces for one year in the ground in very damp and unfavorable places. The coating is liable to have its appearance injured by handling, and for objects where this is a matter of importance, it is better to brush the surface over with grease or wax, which is absorbed into the oxide and remains in it, permanently protecting it. Another property of objects coated with the oxide is specially pointed out as of great value for some purposes, especially for objects of art. The oxide coat easily takes enamelling, silvering, gilding or platinizing. The enamel, or the solution, can be put on direct upon the oxide, and then, after firing, adheres perfectly and has not the tendency to crack off, as in the case of its application to the bare iron. Then a coating of bronze or other metal can be given to objects in the simplest manner by brushing them over with a brush made of the metal in question. So much of the metal penetrates the oxide coating that the result is perfectly permanent.—*Engineering.*

The Creil Experiments. — The members of the Academy of Sciences have been invited to assist in the experiments on the electrical transmission of power between Creil and Paris; and a recent visit paid by them was marked by some curious incidents, which were reported by M. Bertrand at the meeting of the Academy held on the 14th inst. We have already described the special construction of the cable conductor, and we pointed out that it would probably act as a condenser, of which one element would be the cable itself, and the other, the lead sheeting which in the Berthoud-Borel system forms the external surface of the insulation. Under the high tension of the current transmitted, the phenomenon of condensation was produced, and the discharge was assisted by the excessive humidity of the atmosphere during the trials. The conductor, at certain points of its course, passes quite near to various telegraph lines. At one point a contact was established accidentally, the branch of a tree shaken by the wind making the connection; the discharge was assisted by the moisture covering the branch, and it traversed the wire as far as the nearest telegraph station, where it discharged itself in a powerful spark, and damaged the apparatus. From the same cause, the telephone and telegraph instruments at the different forts on the north side of Paris were thrown out of order. In another place, where the conductors passed over a house, a series of sparks were produced to the terror of the people residing in the building. Of course these phenomena were not surprising, and present no argument against the experiment. They simply prove that the type of insulation chosen by the Commission and which is well adapted for less powerful currents, is not so suitable in this case. In the earliest stages of the undertaking this question of insulation was approached with great hesitation on the part of the Commission. An efficient rubber coating was rejected on account of its high cost, and the Berthoud-Borel system was decided upon without any idea being entertained of the curious results that would follow, and which would have been avoided if a simple insulation of tarred cotton had been employed. This would have also had the advantage of cheapness and reduced weight. But as the line is complete, and must be maintained as it is, the inconveniences already experienced will be avoided by making earth connections at each post, so that the electricity condensed on the surface will pass off readily.

The recent trials have also shown the necessity of improving the insulation of the dynamo, and the wisdom of sparing no expense in material and workmanship to insure durability, which is of course one of the first conditions of commercial success. The cost of first establishment will be raised considerably, but that is a small matter compared with the frequent breakdowns, stoppages, and repairs that would follow anything but a first-class installation.

Up to the present the experiments have not gone beyond their preliminary phase, and have given only very approximate results. The scientific data obtained appeared to be very satisfactory to MM. Rothschilds, as they have taken up the matter definitively. It now rests with them to carry the experiment to its conclusion and to solve satisfactorily the industrial problem involved. In order to arrive at this point many further trials will be necessary in order to ascertain accurately the practical data which will control the question, and in which is involved the use of currents of enormous tension which M. Marcel Deprez is endeavoring for the first time to turn to industrial account. — *Engineering.*

Namikawa, Cloisonne Maker.—There are few persons, probably, who are not familiar with the bright blue vases and plates decorated with birds and blossoms which enliven the windows of dealers in Oriental goods and artistic tea merchants. The number possibly is much greater of persons who are unaware, or only imperfectly aware, of the processes of which *cloisonné* enamels are the results, and which have for many generations, since the introduction of the art from China, formed one of the principal artistic industries of Japan. Uninventive themselves, the Japanese possess, in a singular degree, the faculty of perfecting the arts which they have acquired from other nations. Unwearying assiduity, combined with extreme delicacy of touch, render them unrivalled as workmen in the management and elaboration of detail. Their paintings on porcelain, executed with a microscopic minuteness and accuracy, and the fine intricacy of their inlaid and overlaid metal work, are sufficient proofs of their powers in this line. But if any doubt still existed, it would be speedily dissipated by a visit to a workshop where *cloisonné* is being made, and an inspection of the processes involved in its manufacture. The greatest living maker of *cloisonné* in Japan, perhaps in the world also, is one Namikawa, who resides in Kioto, the old capital of the Mikados. A nobleman by birth, he suffered in the troublous times which accompanied the overthrow of the Shogun, and, like many of his compeers, had recourse to trade as a means of livelihood, without, in any way, losing caste. He has established a reputation as the first *cloisonné* manufacturer of the day, and his wares fetch from the dealers whatever price he chooses to set upon them. His courtesy to visitors is extreme, and he seems far more anxious to show them over his establishment than to sell them his goods. In a clean, airy apartment, where the light comes in softly through the paper walls, the workers, men and women, can be seen at their tasks. On the surface of the object, generally of copper, which is to be enamelled, the design is worked out with tiny metal fillets, like flattened wires, of varying lengths and shapes. These are fastened on with a strong glue, and form the *cloisons*, or partitions, which are to separate the differently-colored enamels. This part of the work seems of almost maddening nicety, and must require immense calmness of nerves and steadiness of hand. The design having been thus fixed, the enamels are introduced between the *cloisons*, in the form of a dry paste, by means of diminutive chopsticks. The whole is then baked, after which the various little cracks and crevices which appear in the fused enamel are filled in with fresh paste, and the article again placed in the oven. In the superior work this process is repeated again and again, until the surface is uniform and without flaw, though as yet rough and lustreless. The polishing is done with a stone, and is a long and tedious operation, occupying several months in the case of articles of any size. The effect of the process is to grind down the inequalities of the enamelled surface until the design is left clear and indelible, outlined by the *cloisons*, and with a fine vitreous lustre. It is obvious that wares which require so much time and skill in their manufacture should command a high price, and very high accordingly are the prices for good work. Inferior *cloisonné* can be bought cheap enough, but its purchase is not to be recommended, for, besides flaws in the workmanship, which are apparent at once, the coloring of the enamels is apt to fade. Of course, in order to distinguish good work from bad, it is necessary, as in everything else, to be something of a connoisseur, and especially difficult is it to tell coloring which will be durable from that which will prove transient. With regard to the blue color which so often forms the background of *cloisonné* wares, it is important that this should be of the right shade, as there are blues of many kinds besides the pure turquoise tint that is to be sought after. The amount of decoration, of course, is one of the considerations to be taken into account in determining the value of the article; but this must not be too exclusively relied upon, as it not unfrequently happens that a great deal of labor is expended upon ornamentation which is intended to conceal other defects, and thus the best work is often also the simplest. A background introduced and made a specialty of by Namikawa is composed of a transparent blood-colored enamel dotted with flakes of an opaque white color. Another maker living at Yokohama inserts among his enamels small pieces of goldstone, and other artists have different specialties of a similar kind. Antique *cloisonné* is, as a rule, much discolored, and is for decorative purposes of little value; time will show whether the works of the famous modern makers are to prove more durable.—*Pall Mall Gazette.*

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 526.

JANUARY 23, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

GENERAL MEIGS, in his official report on the construction of the new Pension Building at Washington, gives some rather curious details of the summer ventilation of that great structure. The building was first occupied in summer, before the fans and radiators for artificial heating and ventilation were put in; and General Meigs, finding that the circulation of air through the rooms was unusually satisfactory, interested himself in finding out exactly what the velocity of the various currents was. The offices are arranged about an immense central hall, which is ventilated by louvres under the roof, and the passage of the air from the windows in the exterior walls across the rooms to the outlet provided in the central hall is particularly easy and direct. By placing an anemometer at the various open windows and doors of the building from time to time during the summer months, the velocity of the air entering through the main gates was found to vary from five hundred to one thousand feet per minute, according to whether the opening tested happened to face the wind or not. If all the windows were open, as they would probably be at that season if the building were fully occupied, the quantity of air entering through the openings on the two sides of the building most directly exposed to the wind would be more than four million cubic feet per minute, in average summer weather. To put it in a different way, the amount of fresh air entering through the windows and doors would be about one hundred and forty tons per minute, and would entirely change the atmosphere of the huge building, which covers about two acres of ground, every two minutes. Every architect knows that the difficulty of ventilating a large building in summer increases in proportion to its size, and General Meigs is to be congratulated on the success in this respect which, as his interesting experiments show, he has been able, by his disposition of openings, to secure.

THE committee having in charge the New York monument to General Grant seems to be proceeding in a rather singular way. About one-eighth of the sum intended to be devoted to the monument has been raised, but, according to the New York papers, the committee is of opinion that nothing is now needed except the adoption of a design for the structure to fill the subscription-list to overflowing; and has accordingly resolved to "make a selection at once from the designs submitted." Whether this means that something is now to be done to procure a design in the decent and honorable way usual among civilized people, or that a choice is to be made out of the collection of volunteer devices already in the hands of the committee, we cannot say, but there is reason to suppose that the latter course appears to the committee the more business-like and economical. Whether its results would be in all respects as satisfactory as those which persons accustomed to artistic work secure by the other method is at least doubtful, and we think that architects, artists, editors and other persons of educated taste might, in case the committee fails to use proper means for obtaining the best practicable design for the monument, perform an important public service by examining such plans as the committee may choose to adopt, and preventing, by the use of all the influence in their power, the contribution of money for carrying into execution any design unworthy of the best artistic skill which this country can produce, or of the object to which it is to be applied.

A FEW weeks ago the early passengers crossing the ancient stone bridge known as the Pont Neuf, which spans the Seine between the two oldest quarters of Paris, observed a little crevice in the pavement, extending in an irregular curve entirely across the bridge. On looking over the side it was found that a portion of the second pier from the shore on one side had settled, and was leaning outward over the water. With the promptness characteristic of Continental cities, the officials were notified, the bridge was closed to travel, and two engineers were entrusted with the work of checking the movement of the masonry, and of repairing the damage already done. The first step taken was to remove the spandrel filling over the two arches adjoining the disordered pier, to relieve it of as much weight as possible; and as this disturbed the balance of lateral thrusts upon the sound piers adjoining, the loading of the next two arches was also removed, to distribute the effect of the alteration over the work remaining perfectly solid. While this was going on, a mass of stones was thrown into the river, just above the leaning pier, to protect it from the action of the current. The settlement then ceased, after a total sinking of about sixteen inches, and work was begun on the restoration of the pier and the broken arches resting upon it. There was once a prevalent notion that the piers of the Pont Neuf rested on piles, and some ingenious individual even went so far as to publish a detailed description of the bridge, showing the pile foundations; but copies of contracts recently discovered have shown conclusively that the original builders excavated the river-bed to the solid limestone rock, and built their masonry upon this, with the help of coffer-dams filled-in with clay, in very much the same way that similar work would be carried on now, except that the enclosure was baled out with buckets, instead of being kept clear by a steam pump. Unfortunately, the upper strata of the limestone formation of Paris alternate with strata of sand, and it is thought that in this case the sand beneath the sheet of rock on which the bridge rests may perhaps have escaped in some way, causing a settlement of the mass above it.

LA SEMAINE DES CONSTRUCTEURS, from which we borrow this account of the failure of the Pont Neuf, accompanies it with a clever historical sketch. According to this, the corner-stone of the Pont Neuf was laid in the year 1578, by King Henry III, in presence of his mother, Catherine de Medicis, his queen, Louise of Lorraine, and the principal magistrates of the city. Baptiste Ducerceau has usually the credit of having been the designer of the bridge, but it is probable that Marchand, the architect of the famous staircase at the castle of Saint Germain, together with the engineer-architect Metezeau, and perhaps others, were at least consulted in preparing the plans. Although considerable work was done upon the bridge during the first year, the condition of the country was too much disturbed to permit its steady continuance. Six years before the laying of the corner-stone, the royal personages who dignified that ceremony had themselves given the signal for the massacre of seventy thousand of their Protestant subjects, and the wars of the Huguenots and Catholics soon took up all the money, as well as attention, that princes or people had to spare; and it was not until 1602 that King Henry of Navarre, the Catholic representative of the Protestant party, ordered the work on the bridge to be recommenced. Marchand, who was now the sole architect in charge, pushed the construction vigorously, and in June of the same year the king climbed across the river on the scaffolding, laughing at the dismay which his temerity inspired in the workmen. Five years later, the bridge was opened to the public. Like most bridges of the time, the Pont Neuf was at first encumbered with buildings. Besides a fortified post at one end, which was afterwards used as a marionette theatre, a building stood

upon piles near the middle, containing pumps, by means of which water was drawn from the river below, and forced through pipes into a reservoir, from which were supplied the royal palaces close by; and little shops, filled with velvet gloves, jewelry and other fashionable goods, lined the sidewalks. In the course of the succeeding reigns these obstructions were cleared away, and the Pont Neuf was reduced to its present condition, as a handsome and solid, but not particularly picturesque, bridge.

SOME French physicists, among whom are M. Marcel Deprez and several members of the Rothschild family, have been trying experiments upon the transmission of force by electric currents, and have succeeded in driving the pumps of an hydraulic press in Paris from a dynamo-machine placed at Creil, thirty-two miles away. According to a paper read before the Academy of Sciences by M. Deprez, the trials have been attended with remarkable success, but a curious accident happened the other day, which has a lesson for those who may conduct future essays on electric transmission. According to the *Bulletin des Telephones*, Baron Rothschild had invited a party to Creil to witness some of the experiments, and a considerable number had assembled, and were watching the dynamo-machine, when they saw a brilliant spark, about a yard long, dart from the brushes of the dynamo. Most of them, knowing enough of electricity to judge that this meant mischief, got out of the room by the shortest route. At the same moment, as they afterward learned, a telephone in their workshop in Paris and another in a railway station near by, were burned out, and both a telegraph and a telephone instrument in one of the forts north of the city were destroyed, one of them being almost completely melted. Fortunately, no person was injured, but the accident has caused no small wonder among electricians. It is said that the wire used for conveying the current from Creil to Paris was of silicon bronze, covered with some insulating substance, and enclosed in a lead tube; and the suggestion is made that the passage of the strong current through the wire may have had the effect of charging the lead covering, something in the way that a Leyden jar is charged, and that the tension of the induced electricity in the lead had accumulated so far as to enable the spark to jump a long distance through the air to the nearest good conductor. In this case the cable had, to prevent accidents, been kept as far as possible from other wires, but it seems that it passed quite near the metal roof of one of the railway signal-stations, and on previous occasions the rain of sparks from the cable to the station roof had so alarmed the signal-man that he had left his place to complain to the superintendent of the railway of his troubles. Perhaps measures had been taken to remove the cable to a greater distance from the roof which had previously afforded it relief; or the roof may have been in some way insulated, so as to compel the current to take some other course for escape; and its next available path seems to have been by the way of the telegraph and telephone wires, which in one place, where all passed together through a gallery in the fortifications, were necessarily placed a little more than a yard away.

MOST persons have heard of the process for facilitating the drilling of artesian wells through strata of quicksand, by freezing the quicksand with liquids brought to a very low temperature. and circulated through pipes introduced through the well-tubing. *La Revue Industrielle* gives an account of an ingenious modification of this process, put in practice by a Swedish contractor for his own benefit, which deserves to be kept in mind for future occasions. The contractor had undertaken to drive a tunnel through a hill, on which stood a number of large houses. As the excavation went on, it was discovered that the surface of the hill was underlaid, in many places, by masses of gravel, mixed with sand, and saturated with water, which ran out immediately into any excavation made in it. The escape of any considerable quantity of this material from under a building would infallibly ruin the building; and the foundation was so soft that the tunnel could not be lined with sufficient rapidity to prevent serious escapes. To underpin the houses from the level of the tunnel would have been a costly undertaking, and the contractor was obliged to have recourse to his wits for a solution of the problem. Fortunately, these did not fail him. It occurred to him that, if the wet gravel could be frozen, it might be worked as well as a hard material; and he considered whether it might not be possible to throw a stream of cold air upon it from one of the cooling-machines now so often used. Inspired with this idea, he crossed the sea to England, and bought a Lightfoot ice-machine, which he brought back with him and set up in the tunnel. The result surpassed his expectations. Before the cold blast the quicksand became a rock, which could be cut and worked easily and safely, and within a few weeks he passed under two five-story houses without experiencing any troubles.

THE Americans have the reputation of being foremost among the nations of the world in the preparation of "fancy drinks," and this industry has here reached a development unknown elsewhere. Among the most popular of our beverages is soda-water, enough of which is probably drawn every day in hot weather to float a small ship; and the manufacture of soda-water is a flourishing one. Every one knows that the modern soda-water, instead of being made by the druggist out of carbonate of soda and tartaric acid, is formed in the fountain from which it is drawn, by saturating the water contained in the fountain with carbonic acid gas, under a considerable pressure. By a simple mechanism syrups of various sorts are mixed with the stream of water as it is drawn; and as the pressure on the surface of the water is released the gas escapes, raising on the surface of the sweetened liquid the foam so agreeable to the taste of little boys. The carbonic acid for impregnating the water is now rarely prepared by the druggist, but is bought ready-made from the manufacturers, who liberate it from marble dust by means of sulphuric acid, and force it, by means of a condensing-pump, into strong steel cylinders. These cylinders have couplings, by which they can be attached to the reservoir of the fountains in the druggists' shops, and when one is empty it is removed, and replaced by a full one. In order to save transportation, as much gas as possible is compressed into each cylinder, and the condensation often reaches actual liquefaction of the gas, so that when the druggist opens the communication between the cylinder and the fountain a cloud of carbonic-acid snow, frozen from the liquid gas by the cold due to sudden evaporation, rushes out of the cylinder.

THIS phenomenon, although common enough here, does not seem to have suggested to American druggists any very valuable ideas, but in Germany, where the sale of carbonic acid to restaurants for impregnating seltzer water and beer is a comparatively new business, several interesting developments of the manufacture have already been undertaken. In order to secure a definite condition of condensation, the carbonic acid is now, for certain purposes, furnished in a solid form, the gas being first liquefied, then converted into snow by evaporation, and the snow finally collected and compressed into masses resembling chalk. Singular as it may seem, this solid or liquid carbonic acid has, so far, according to the *Revue Industrielle*, found its principal employment in a huge iron foundry, that of Krupp, at Essen. One of the uses to which it is applied there is similar to that for which the hydrostatic press is employed at the Whitworth foundry, in England, the liquid gas being introduced into air-tight moulds filled with melted steel, and allowed to expand. The force of expansion, pressing on the surface of the melted steel, drives it into every crevice of the moulds, and squeezes out the air-bubbles, which interfere so seriously with the solidity of most large steel castings. The other application which Herr Krupp makes of his liquid carbonic acid is even more curious than the first. Nearly all large cannon are made in Europe at present with a central tube, reinforced by several steel or iron rings, shrunk on, like the tire of a wheel; and Herr Krupp, into whose hands a great number of condemned cannon fall, finds it desirable to separate and save the rings, which may be as good as new, after the central tube is worn out. This separation, which is difficult to effect in any other way, is readily accomplished by means of liquid carbonic acid. The condemned gun is heated to the proper degree, and a stream of liquid carbonic acid is then suddenly poured into the bore. The evaporation of the acid produces intense cold, chilling the metal which it touches probably below the freezing point of mercury; and the tube contracts, releasing itself for an instant from the hot reinforcing bands, which are, at that moment, easily knocked off.

MURAL PAINTING.[1] — II.



Personification of Encaustic, from Pompeii.

Mural painting and monumental sculpture are the highest expressions of decorative art. Unfortunately, the expression "decorative art" is almost tantamount to a term of reproach. Artists say rather slightingly of a *confrère* that "he has gone into decoration." As Viollet-le-Duc asks, What is decorative art? Where is the line to be drawn between it and other forms of art? Is there any form of art that is not decorative? The metopes of the Parthenon, the frescoes of the Sistine, and the stanze of the Vatican are examples of so-called decorative art; yet it may be presumed that Phidias, Michael Angelo and Raphael would be somewhat surprised, were they to return among us, not to find themselves in "smart" artistic society. Does a picture or a statue cease to be decorative when it is executed for no particular place? Does it cease to be decorative when it is portable? Is there any particular charm in portability? Portability has its advantages. A man can decamp at short notice with all his household gods; but certainly no one has ever eulogized art for this reason. Has any artist ever discovered a system of painting or sculpture universally adaptable to the ever-varying conditions of light and place? If any one has been so ingenious, he must have locked the secret up in his own consciousness. Is the ulterior destination of easel pictures, then, ignored by the painter? In the majority of cases it would seem so, unless the picture be painted to order for a given place. The poor mural painter — or monumental sculptor — has to bother his brains very much about the conditions of light and place, and to make many a reluctant sacrifice to them. Because an art takes cognizance of its environments, is it inferior to an art that trusts to luck for its setting?

Far be it from me to depreciate the easel picture in my eagerness to exalt monumental art. To do anything well is an arduous task. Comparisons between the kindred arts are not only odious and sterile, but well-nigh impossible without the bias of personal preference. Leonardo's spleen when he vaunts the superiority of painting over sculpture — owing, probably, to a grudge against Michael Angelo — is delicious reading. Hear him: "The sculptor by blows and muscle wears away the marble or superfluous stone that exceeds the figure which is enclosed within it — a very mechanical operation — in a great sweat mixed with dust and converted into mud, his face well pasted, and completely powdered with marble dust, so that he looks like a baker, and covered with minute chips, as if he had been snowed upon, and his house [is] filthy, and full of chips and stone-dust; whilst the well-dressed painter sits comfortably before his work, and manipulates light brushes and exquisite colors, adorned with garments to his taste, and his house is full of beautiful paintings," etc. His atrabiliousness entirely runs away with his style and stops. Michael Angelo's tirade against oil painting was unworthy of him; but when he waxed old, and approaching death mellowed his austere temperament, he kindly and fairly writes to Benedetto Varchi, estimating by request the comparative supremacy of painting and sculpture: ". . . . then painting and sculpture may be considered equal, and this being admitted, it follows that no painter should undervalue sculpture, nor should any sculptor depreciate painting."[2]

It has been said that all good painting comes from the wall. (Almost to a man the "big ones" have painted on, or for, the wall.) This may be a somewhat superlative statement, but there is a germ of truth in it. In its higher phases mural painting is an excellent antidote to the vagaries of fashion, being intolerant of impertinent eccentricities and egotistical extravagances. It must be dignified and appropriate, as well as free from all ephemeral picturesqueness. Wouldn't art gain something were the painters of the easel picture to take a hint from their mural brethren, and consider the final destination of their work? The ultimate resting-place of a picture cannot be predicted with certainty; yet it is fair to assume that the majority of paintings, if they be of moderate size, will eventually hang in a dwelling-house. As a matter of fact, many painters — too many, it is to be feared — whilst incubating, are thinking very much more of the next important exhibition than of the quiet little nook where perchance their creation will find itself, feebly lighted and at close quarters with the family.

Exhibitions are useful disseminators of art. To the public they are beneficent teachers; to the artists themselves, while they are undeniably of great advantage as criterions of comparative merit, they are also fraught with grave danger. As for the concomitant system of medals and prizes, it is enough "to drag angels down." Let them be relegated to the domain of the schoolboy; there are worthier prizes for the artist than medals and red ribbon — the great prizes of life, honor and success, not to mention the mere joy of creation. This prize system is just beginning to take root here; let us eradicate it ere it is too late. In other countries it has tarnished many brilliant names. Great men have belittled themselves in their scramble for rewards. Jurymen have first bedizened their own button-holes and then bedecked their henchmen. Intrigues and enmities quite as crafty and fierce as those of the political arena are rampant in the lists of art. The Olympic games were favorable to the development of symmetry and heroic action. Perfect Greek met perfect Greek in nerve and limb testing struggle; and a simple garland of wild olive sufficed to immortalize the mightiest. Had these games been semi-annual, instead of quadrennial, with interludes of the Nemean, Pythian and Isthmian, they would soon have degenerated into "go-as-you-please" matches, with vulgar belts and purses to allure equally vulgar champions. The present mania for exhibitions is fast lowering them to the level of the show, and in many cases to the pecuniary advantage of the showmen. That picture-dealers should speculate in art is just and natural. There is no humbug about their calling. But there is a vast amount of humbug underlying the self-sacrificing manifestoes of the benevolent art-agent. If exhibitions are great picture marts, let it be frankly acknowledged: there is no sin in it, and art is degraded by the lie. But pray, gentlemen, dispense with the solicitous cant about the welfare of the American public.

There remains one more observation to be made about exhibitions (having little, apparently, to do with mural painting, save indirectly), and that is their distracting influence on the younger artists, not to mention the older. "One must be seen to be appreciated," they say; "but *coûte que coûte*, one must be seen." Either motive or technique must be noisy, so that those who run may read. This is frequently the key-note to production, and what a key-note to sonnet or epic! How can any heartfelt song be attuned to it? At times it would seem as though the whole artistic world were "Salon"-struck, insular England excepted, be it said to her credit. The spaciousness and garish light of a gallery exact a very different handling from the quiet light of home, where, by the way, a picture can choose its neighbors without elbowing them.

The mental attitude of the prospective exhibitor is unhealthy. Unharassed concentration and personal inspiration are requisite for the evolution of an idea. There is a temptation to force a note for an exhibition, or to sacrifice personality to a fashion set by some hero of the hour. An artist must be very self-reliant or unreceptive not to lose his head; very confident and shrewd to glean the few wholesome hints that will strengthen his own expression without stealing the soul of his brother-artist. The mural painter is a perpetual exhibitor. He exhibits naturally, not artificially; he paints for a given place under definite conditions. He is not obliged to whistle to the passer-by, nor is he bothered by whistling neighbors. He is himself, when left to his own resources. When left to his own resources! Could he only assert himself with the haughty stubbornness of Michael Angelo, who rode rough-shod over popes! If popes, too, were equally complaisant! "I said to the pope," writes Buanarroti concerning the Sistine, "that to represent the Apostles only it would prove a poor thing; he asked me why. I said to him, because they were poor also. Then he gave me a new commission that I should do what I pleased. . ."

A comparatively limited experience has verified the opinion — which may be erroneous, seeing that it is well-nigh impossible to substantiate a generalization without very extended researches — that the attitude of educated people in matters of taste is far less deferential to professional judgment in this than in other countries, and relatively far more deferential to the *ex cathedra* utterances of the other professions. Taste is apparently too obvious to admit of cultivation, and personal preferences suffice. However this may be, the attitude of the profession, and the architectural profession as well, is too yielding. Talk earnestly, sensibly, firmly to a man of common-sense and an impression will be made, unless his will is adamantine. Firmness and tact work marvels. Clients can exercise a great deal of taste under professional advice. The primary conditions they impose, the man they select to work out these conditions, and the decision of the many alternatives that are presented to them, all imply personal taste. In cases involving professional science an architect should be absolute. From the first he should work with a view to mural paintings, if there are to be any. The mural painter has to take things as he finds them. He is generally summoned at the last moment, when it is too late to choose his grounds. He has to make the best of faulty conditions. Pigments must be applied to half-dried and inferior plaster. Why? Because the client is in a hurry, or because the architect has not personally tested the plaster and its application, or because the paintings have been suggested at the eleventh hour. The architects are doing much, through their associations, to strengthen and dignify their position. Would that the decorators would follow their

[1] Continued from page 29, No. 525.
[2] "*Life of Michael Angelo*:" Charles Heath Wilson.

example instead of cutting each others' throats. The relations between architect, client and decorator are, to say the least, very trying. Theoretically, when employed by the architect, the decorator does not recognize the client. Actually it is very different. Not infrequently he finds himself between two fires, and in his efforts to please two masters pleases none.

It is to be regretted that there is no department in our larger art schools where mural painting is taught. The regular academic figure-work, though necessary, is not enough. It should be supplemented not only by a course of elementary architectural and decorative forms, but by instruction in the monumental treatment of figures, as well as by lectures on walls and plaster, on the chemistry of colors, their deterioration under climatic, solar or gaseous influences, in fact, on all the mechanical part of decorative art. Greatly to their disadvantage our artists know almost nothing about the chemistry of colors, oils, varnishes, and their behavior under trying conditions. Pictures frequently blacken or crack in a way that is quite unaccountable. It may be owing to the ground, the vehicle, colors, or undue haste. Who can tell? Artists rely implicitly on the colormen. It is well that labor should be divided in these bustling days, and that our materials should be prepared for us by others. But it is not well to delegate all *knowledge* of them. Cennino Cennini [1437] allows "the space of six years at least" to "learn all the parts and members of the art," and six years more for the practice of it, "drawing without intermission on holydays and weekdays." If an artist is moved by the praiseworthy impulse to make a few investigations, he is forthwith confronted by a disheartening disagreement of the doctors. Here is a hap-hazard example. Indian yellow is classed by several authors among the dangerous pigments; while Ulisse Forni, restorer of the royal galleries at Florence, describes it as a "beautiful and durable color in nowise noxious." Some of the most charming qualities in modern pictures are gained at the expense of durability; such a quality, for instance, as texture—unless great care be observed. Where paint is unevenly and lumpily applied, it is very apt to crack, especially if the undertone be not thoroughly dry. In out-of-door work where time is an object to the artist, the undertone has very rarely time to dry properly; recourse is then had to the doubtful expedient of powerful siccatives. Perhaps it is not known to the average painter that the rather popular palette-knife execution is more liable to crack than brush-work—the air acting on the latter more readily. Artists are daily employing methods that would have shocked the atelier-bred men of the Renaissance; not from lack of moral sense, but from sheer ignorance of the physical laws relating to their craft. Unfortunately, unpunished offences promote this ignorance, and engender indifference, to boot. It is authoritatively said that deterioration is the logical sequence of certain evil methods. This is not always the case, the conditions environing a picture being exceedingly complex, and possibly harboring an unsuspected antidote. Yet impunity from degeneration is frequently enjoyed for a space only — time settling the account.

The ideal school for the mural painter must have been the studio of the Renaissance — Perugino's, for instance, where practice and precept were most happily combined. Great works were consummated under the eye of the pupil, himself a coadjutor when sufficiently advanced. His relations with the master were intimate, as they should be. The master was the father of the artistic family. He exacted obedience which — if he were a man of note — was cheerfully rendered. In return the pupil was relieved of all anxiety. He was taught everything worth teaching. Instead of flitting from master to master, as students are prone to do now-a-days, bound by no t'e, following their own immature judgment, he was regularly apprenticed by his parents to some reputable artist with whom he worked till maturity. Didron, in his "*Manuel d'Iconographie Chrétienne*," a work to which future reference will be made, describes an interesting scene he witnessed in the atelier of Father Macarios, one of the best Byzantine painters on Mount Athos, who still hold to the mediæval methods. In alluding to a certain Greek manuscript—a perfect thesaurus of all that a painter should know, called in fact the "Painter's Guide," and dating back in precept to the eleventh century—he says: "This Bible of his art was placed in the middle of the atelier, and two of the young pupils read from it, alternately in a loud voice, whilst the others painted as they listened." What delightful and easy co-operation!

The rigors of a trying climate would probably make short work of any painting on the exterior of our buildings. In milder countries even it has fared badly with frescoes exposed to the open air. Would that Giorgione had never painted on palace façades. The actinic rays of the sun, sea-air, dampness, changes of temperature rapidly deteriorate all pigments. It is said that successful experiments have lately been made in Germany to render mural paintings weatherproof by a process resembling the water-glass method, though not identical with it. This may be so, yet one is inclined to doubt its permanent durability. At all events time alone can guarantee it.[1] Even the recently-discovered endolithic process, where the colors are imbibed by the marble and incorporated with it, will not resist atmospheric deterioration. It is, however, admirably adapted to certain indoor uses where marble is desirable, for example in a bath-room. Of exposed vermilion, Vitruvius says, "In open places, such as peristylia or exedræ, and similar situations whereto the rays of the sun and moon penetrate, the brilliancy of the color is destroyed by contact with them, and it becomes black. Thus, as it has happened to many others, Faberius, the scribe, wishing to have his house on the Aventine elegantly finished, colored the walls of the peristylia with vermilion. In the course of thirty days they turned to a disagreeable, uneven color; on which account he was obliged to agree with the contractors to lay on other colors. Those who are particular in this respect, and are desirous that the vermilion should retain its color, should, when the wall is colored and dry, rub it with a hard brush charged with Punic wax melted and tempered with oil; then, with live coals in an iron pan, the wall should be thoroughly heated, so as to melt the wax and make it lie even, and then rubbed with a candle and clean cloth, as they do marble statues. This practice is called καύσις by the Greeks," [Gwilt's translation]. Its power to resist the action of acids has frequently suggested the use of wax with pigments. As observed by Vitruvius, the Greeks saturated their marble statues with it to protect them from atmospheric corrosion. It would be interesting and profitable to apply an out-of-door test to ordinary oil house-paints, either mixed with wax dissolved in turpentine, or laid on in the usual fashion with a final coat of liquefied wax and oil. The durability of paint might thus be prolonged several years, though nothing probably would adhere to our walls either externally or internally as they did to those of Vitruvius. What walls they were! It would be well for architects to familiarize their clients with his chapter on plastering. "Three sand coats and the same number of marble-dust coats;" but the preparation of the walls and the use of wax will be treated more fully in subsequent papers.

Mosaic is undoubtedly the best medium for exterior pictures. It is both durable and decorative. It harmonizes with stone, marble, or even brick. If the stone or marble be highly colored or polished, the mosaic may be rich and brilliant in tone. If, on the contrary, they be low-toned or dull, care must be taken to use tesseræ of quiet materials. Mosaics can be slightly deadened by using a white cement and allowing it to be visible in the interstices. Mosaic does not harmonize with painted wood. Its juxtaposition to any wood is open to criticism. Glazed encaustic tiles are also well adapted to out-of-door decoration. Our climate favors the use of color in façades. Our sun is as splendid as that of more southern climes. The reflected lights are strong; therefore it is well to accentuate architectural forms with color. Moreover, color is in keeping with our brilliant skies and foliage. In gray England or northern France it discords with the leaden atmosphere. We are just accustoming ourselves to its use. The denizen of the "brown-stone front" was somewhat shocked at first, but even he is beginning to yield. While the private citizen may prefer to present a quiet and dignified façade to the street, from motives of modesty, public buildings have the right, and ought to blaze with a fair amount of splendor.

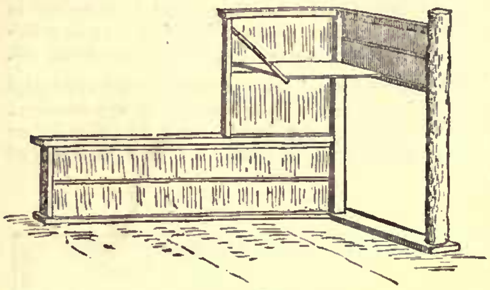
FREDERIC CROWNINSHIELD.

[To be continued.]

[1] This process was invented by Adolph Keim of Munich. The artists on the commission sum up their report with these remarks: "According to the foregoing opinions, Mr. Keim has undoubtedly succeeded in providing a method of monumental painting carefully thought out, even to the smallest detail, grounded on scientific principles, and practically verified by visible facts, which is by far to be preferred to all methods of painting hitherto existent, and which, once recognized for its high value, would bring about a complete revolution in all our monumental and decorative art, and which deserves the widest publication and practical employment." [*American Architect*, Vol. XV, No. 429.] May this unstinted praise be verified by time! Yet almost as handsome things were said years ago of the stereo-chrome, or water-glass process, which has since proved perishable. For example: "In order to test the advantages of stereochromy, proof plates were submitted to the roughest treatment; they were exposed for weeks to rain and frost; the ice which had formed upon them was allowed to thaw in a warm room and this freezing and thawing process was repeated without in the slightest degree damaging the plates, whilst fresco paintings treated in the same manner became quite friable, and crumbled to pieces;" and more in the same strain From W. Cave Thomas "*Mural Decoration*."] Time—the true test—has scaled off the colors submitted to the water-glass treatment. "Certain colors in particular, as ultramarine, amber and black, were observed to be always the first to detach themselves in the form of powder, or by scaling off from the painting, thus pointing to the fact that their destruction was not owing to any accidental defect in the manner of their application, but to some radical unsuitability arising from the chemical conditions of the process. [*American Architect*, Vol. XV No. 429.]

THE ORIGIN OF GOLDEN CITY, COLO. — Students of maps may have noticed upon nearly all maps of Colorado issued during the past twenty years, a settlement indicated upon White River, near the western boundary of the State, denominated Golden or Goblin City. This is a curious example of the persistence of a geographical blunder. Many years ago an army expedition traversed this region, going from Fort Bridger, Wyo., to old Fort Massachusetts, Col. In this neighborhood are bad lands, eroded into curious forms, which naturally suggest a ruined city; and the commander of the expedition gave the locality the name of Goblin City, which name appeared on his map. The map-makers, in their haste to fill up the blanks in this unsettled region, jumped to the conclusion that this was a veritable settlement, and gave it a place on their maps — a place which it has ever since retained. Not only have the commercial map-makers, almost without exception, fallen into this error, but such authorities as the United States Engineer Office and General Land Office have adopted it. The name has, however, been gradually changed from Goblin to Goldin, and thence to Golden City, while more than one enterprising map-maker, reasoning, probably, that a city cannot exist without means of communication with other settlements, has constructed on paper a road down the White River to it. It is scarcely necessary to add that there is not, and never was, a settlement in this neighborhood. — *Boston Transcript*.

JAPANESE HOMES AND THEIR SURROUNDINGS.[2]—III.

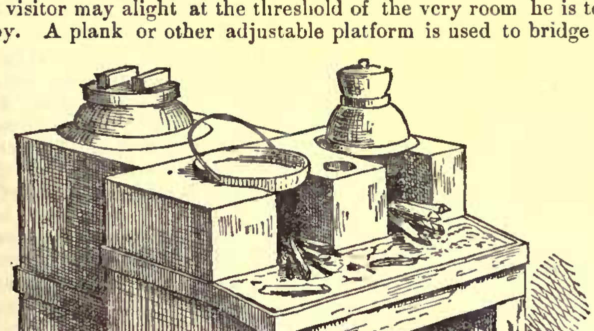

Figure 1. Furosaki biyo-bu.

THE fact that we feel justified in once more making the following widely detached extracts from Professor Morse's interesting book, may be taken as at once a proof of the abundance of the material from which they are selected and as samples of what remains: —

A LOW screen of two folds, called a *furosaki biyō-bu* is placed in front of the *furo*, or fire-vessel, used for boiling water for tea. The purpose of this is to screen the *furo* from the wind and prevent the ashes from being blown about the room. Sometimes these screens are made in a rigid form of wood, with the wings at right angles, the panels being of rush; and in the corner of the screen a little shelf is fixed, upon which the tea-utensils may be placed. Such an one is here figured; there are many designs for this kind of screen.

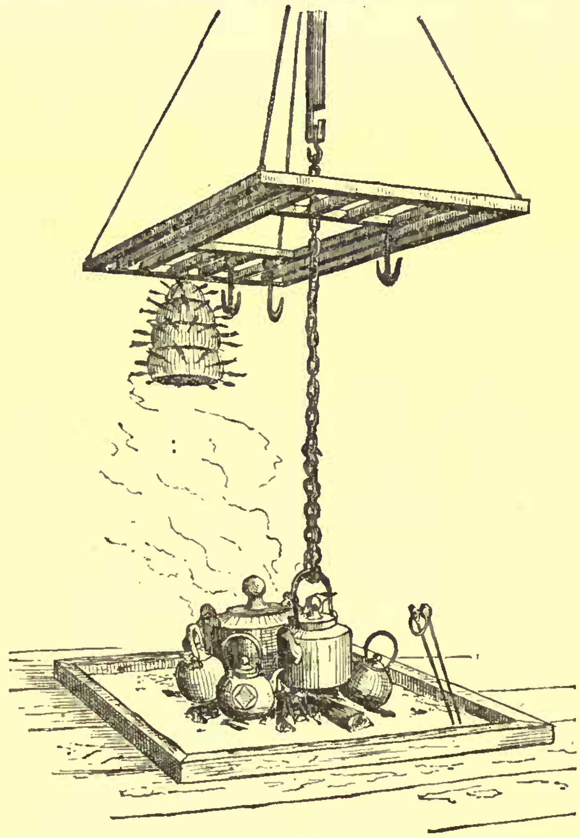
THE kitchen, as an apartment, varies quite as much in Japan as it does in our country, and varies in the same way; that is to say, in the country in houses of the better class, both in Japan and the United States, the kitchen is large and oftentimes spacious, well lighted and airy, in which not only the preparation of food and the washing of dishes go on, but in which also the meals are served. The kitchen of the common city house in both countries is oftentimes a dark narrow room, ill-lighted, and altogether devoid of comfort for the cook. Among this class of houses the kitchen is the least defined of Japanese rooms; it lacks that tidiness and definition so characteristic of the other rooms. It is often a narrow porch or shed with pent roof, rarely, if ever, possessing a ceiling; its exposed rafters are blackened by the smoke, which finds egress through a scuttle, through which often comes the only light that illuminates the dim interior. In the city house the kitchen often comes on that side of the house next the street, for the reason that the garden being in the rear of the house the best rooms face that area; being on the street, too, the kitchen is convenient for the vender of fish and vegetables, and for all the kitchen traffic, which too often with us results in the strewing of our little grass-plots with the wrapping-paper of the butcher's bundles and other pleasing reminiscences of the day's dinner. In the country the kitchen is generally at the end of the house, usually opening into some porch-like expansion, where the tubs, buckets, etc., and the winter's supply of wood find convenient storage.

In public inns and large country houses, and also in many of the larger city tea-houses, the customary raised floor is divided by a narrow area, which has for its floor the hard-trodden earth; and this area forms an avenue from the road to the heart of the house, and even through the house to the garden beyond. This enables one to pass to the centre of the house without the necessity of removing one's shoes. Porters and servants bring the guest's baggage and deposit it directly upon the mats; and in the inns more privacy is secured by the *kago* being brought to the centre of the house, where the visitor may alight at the threshold of the very room he is to occupy. A plank or other adjustable platform is used to bridge this


Figure 2. Kitchen Range.

avenue, so that occupants may go from one portion of the house to another in their bare or stockinged feet.

If this area is in a public inn, the office, common room and kitchen border one side of this thoroughfare. In the common room the baby-tending, sewing, and the various duties of the family go on under the heavily-raftered and thatched roof, which blackened by the smoke from the kitchen fire, and festooned with equally-blackened cobwebs presents a weird appearance when lighted up by the ruddy glow from the hearth. We speak now of the northern country houses, particularly where the fireplace, as in the Aino house, is in the middle of the floor. In country houses of the better class the kitchen is large and roomy; the well is always conveniently near, and often under the same roof. An enormous quantity of water is used in the kitchen of a Japanese house; and if the well is outside, then a trough is arranged beside the well, into which the water is poured, and from this


Figure 3. Fireplace in Country House.

trough a bamboo spout conveys the water into a big water-tank within the kitchen. In the vicinity of the well it is always wet and sloppy; the vegetables, rice, dishes, and nearly every utensil and article of food seems to come under this deluge of water.

THE usual form of kitchen range is represented in Figure 2; this is made of broken tiles and mud or clay compacted together and neatly plastered and blackened on the outside. In this range there are two recesses for fire, which open directly in front; and this structure rests upon a stout wooden frame having a place for ashes in front, and a space beneath in which the wood and charcoal are kept. Sometimes this range, retaining the same form, is made of copper; within this water is kept, and little openings permit the wine-bottle to be immersed in order to heat it, as the *sake* is drunk hot without the admixture of hot water.

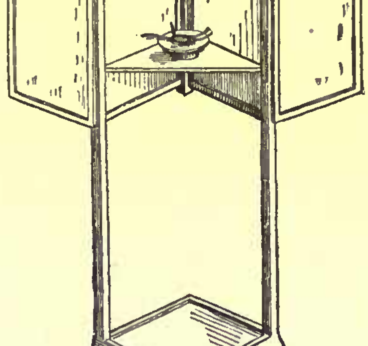

Figure 4. Lamp.

FIGURE 3 gives a view of a common arrangement for the kitchen in the north of Japan, and in the country everywhere. Here the fireplace is in the centre of the room. A kettle is suspended over the fire by a chain, and other kettles are huddled around it to be heated. Overhead a rack hangs, from which fish and meat are suspended, and thus the smoke which ascends from the fire is utilized in curing them. Sometimes a large cushion of straw is suspended above the smoke, and little fish skewered with pointed sticks are thrust into this bunch of straw like pins in a pin-cushion.

IN Figure 6 a more elaborate affair is shown from which to suspend the tea-kettle. This is a complex mechanism with a curious joint, so that it may be hoisted or lowered at will.

In the front of Figure 6 a square copper box is noticed, having two round openings. This box is filled with water, which becomes heated by the fire, and is for the purpose of warming the *sake* or wine. The tongs are stuck into the ashes in one corner. These consist of a long pair of iron chop-sticks held together at one end by

[2] "*Japanese Homes and their Surroundings*," by Edward S. Morse, late Professor of Zoology, University of Tokio, Japan; with illustrations by the Author. Ticknor & Co. 1886. Price, $5.00. Continued from No. 525, Page 33.

a large ring, so that one leg of the tongs, so to speak, may not get misplaced. No inconsiderable skill is required to pick up hot coals

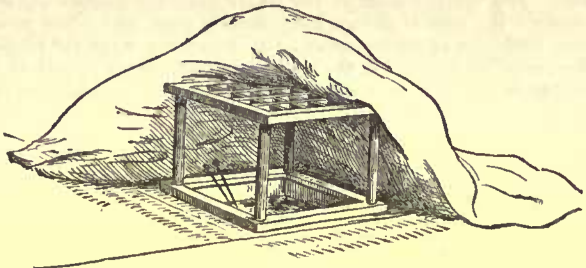


Figure 5. Heating Arrangement in Floor.

with this kitchen implement, as in unaccustomed or awkward hands the ring prevents the points from coming together.

In a crowded inn each guest may occupy the dimensions of one mat; and the entire floor is occupied in this way. In winter a thickly-wadded comforter is provided, which is made in the form of a huge garment having capacious sleeves. Many rooms have a square hole in the floor in which, when needed, a fire of charcoal may be kindled; this is called a *ro*. Above the *ro* a square frame of wood is adjusted, and the bedclothes being placed over this frame, are thoroughly heated, so that one may go to bed in the warmest of nests. In the day-time one may gather a portion of the bed-clothes about him, and keep warm by the little coal-fire burning beneath. Figure 5 is an illustration of this opening in the floor, with framework above to keep the bedclothes from falling on the fire below. A little wooden box is used for the purpose of holding an earthen receptacle for coals, and this is taken to bed as a substitute for the hot stone or brick, which is often used at home for a similar purpose. From the inflammable nature of the bedding, many fires must originate frōm carelessness in the use of this luxury.

The Japanese lamp is usually in the form of a shallow saucer, in which vegetable oil is burned. The wick, consisting of long slender rods of pith, is held down by a little ring of iron, to which a spur is attachedfor a handle. The unburned portion of the wick projects beyond the saucer, and as it burns away at one end is moved along. The saucer rests in a disk or ring of iron, which is suspended within a frame covered with paper. A common form of this lamp or *andon* consists of a square frame of wood covered with paper, open above and below, and having one side in the shape of a movable lid, which can be raised when the lamp needs tending. This frame is secured to two uprights, which spring from a wooden stand in which may be a drawer containing extra wicks and a pair of snuffers. These uprights extend above the lantern, and have a cross-piece by which the lantern is lifted, and another cross-bar just below from which the lamp hangs. The light from this night-lamp is feeble and uncertain, and by it one can barely see his way about the room.

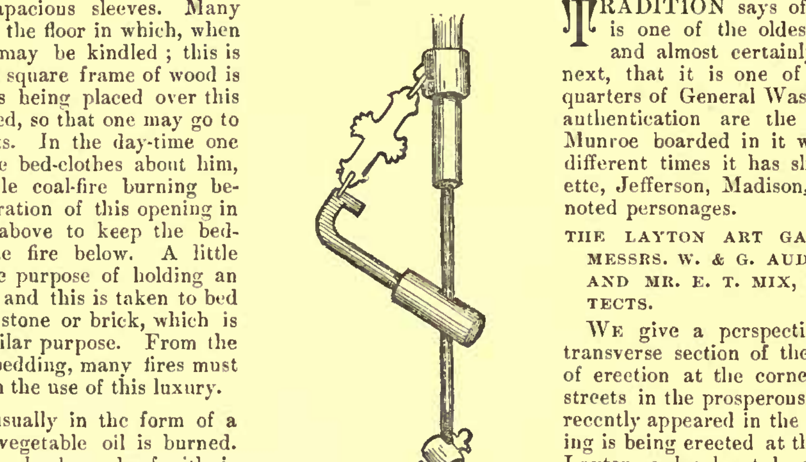


Figure 6. The best Fireplace.

There are many kinds of *andon*, some being very ingenious. One

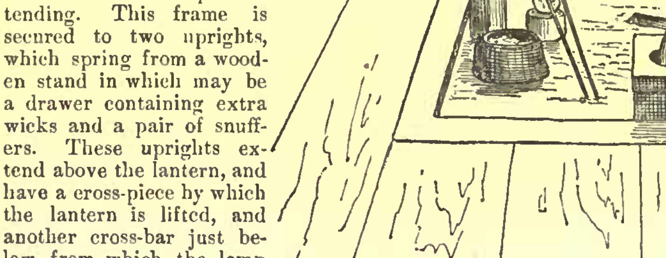


Figure 7. Stone Foot-Bridge.

form is cylindrical, being composed of two frames, one within the other,— the outer frame revolving in a groove in the stand. One-half of each lantern is covered with paper, so that by turning the outer frame the openings are brought together, and thus access is gained to the lamp. Another form of *andon* (Fig. 4) opens in a different way, with a little shelf in one corner to hold the saucer of oil.

The little bridges of stone and wood are extremely good examples of rustic-work, and might be copied with advantage in our country. The ingenious device of displacing the stones laterally (Fig. 7), or of combining the bridge with stepping-stones, as seen in some of them is decidedly unique.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE OLD STONE HOUSE, NEAR RICHMOND, VA.

Tradition says of this building, first, that it is one of the oldest buildings in the country, and almost certainly the oldest in Richmond; next, that it is one of the multitudinous "head-quarters of General Washington." More possible of authentication are the statements that President Munroe boarded in it when a student, and that at different times it has sheltered Washington, Lafayette, Jefferson, Madison, Patrick Henry and other noted personages.

THE LAYTON ART GALLERY, MILWAUKEE, WIS. MESSRS. W. & G. AUDSLEY, FF.R.I.B.A., LONDON, AND MR. E. T. MIX, MILWAUKEE, WIS., ARCHITECTS.

We give a perspective view, ground plan, and transverse section of the art gallery now in course of erection at the corner of Jefferson and Mason streets in the prosperous town of Milwaukee, which recently appeared in the *Building News*. The building is being erected at the sole expense of Mr. Fred Layton, a local art lover and successful merchant, who intends, on its completion, to present it to the town. The ground, or principal floor, comprises three picture-galleries, opening conveniently from a central apartment, and connected together by wide doors. These and the central gallery to be devoted to statuary are lighted by skylights of ample dimensions. On this floor are a curator's room, retiring and cloak room, and lavatories, all conveniently situated near the entrance-hall. In the basement are two large rooms and an unpacking-room, and extensive arrangements are provided for the heating and ventilating — a matter of the first importance in a climate such as that of Wisconsin. The exterior of the building is being constructed of the best quality of buff Amherst sandstone, straw-colored Milwaukee-pressed brick, and terra-cotta of a similar tint manufactured by Messrs. True, Brunkhorst & Co., of Chicago. Granite, plain and polished, will be used for steps, and certain other portions liable to wear and injury. The roofing will be of tin-plate, laid on terra-cotta roofing plates, supported by T-iron rafters. This class of covering has been found to stand best in the neighborhood of Milwaukee under all extremes of temperature.

HOUSE AT PETERSHAM, MASS. MR. W. R. EMERSON, ARCHITECT, BOSTON, MASS.

DOUBLE HOUSE, MINNEAPOLIS, MINN. MR. J. C. PLANT, ARCHITECT, MINNEAPOLIS, MINN.

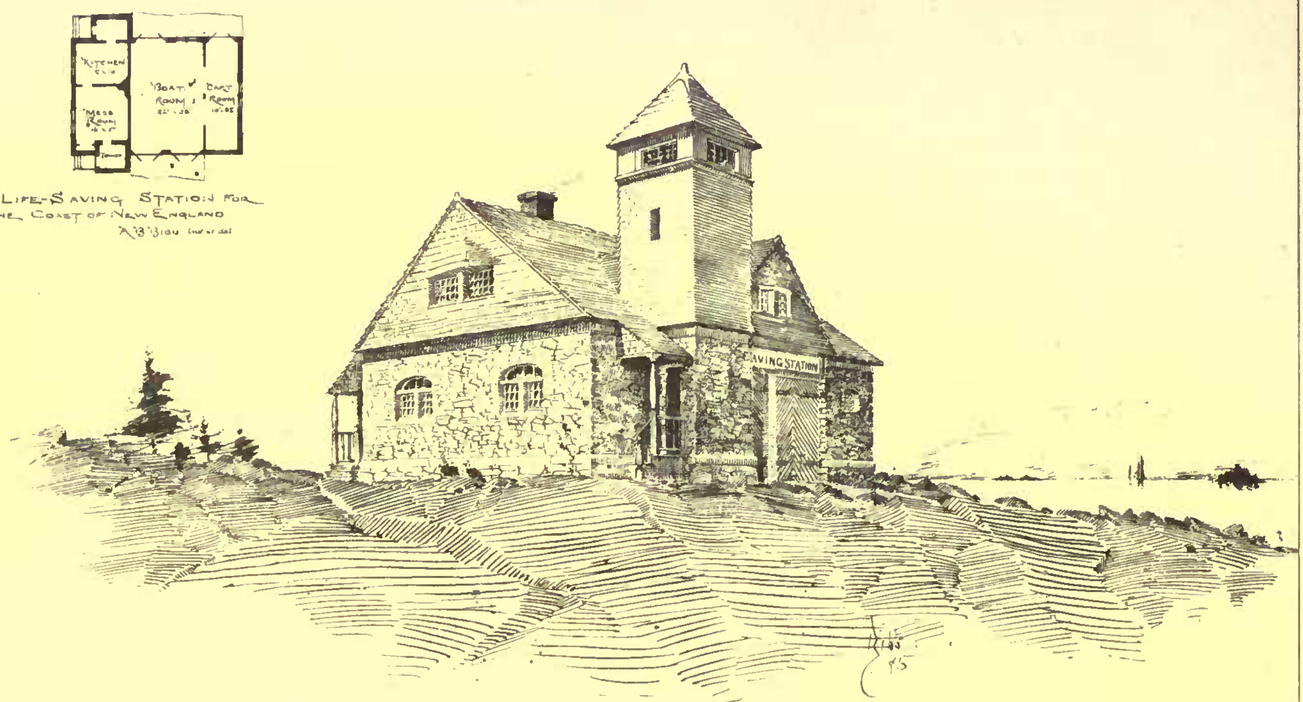
The first story is of Minneapolis blue limestone with red brick water-table, quoins, etc.; the second story is of shingles. It is at present arranged as a double house, and occupied by two branches of the same family, but it is so constructed that in the future it may be made easily into a single dwelling. The total cost, including plumbing and steam-heating apparatus was about $10,000.

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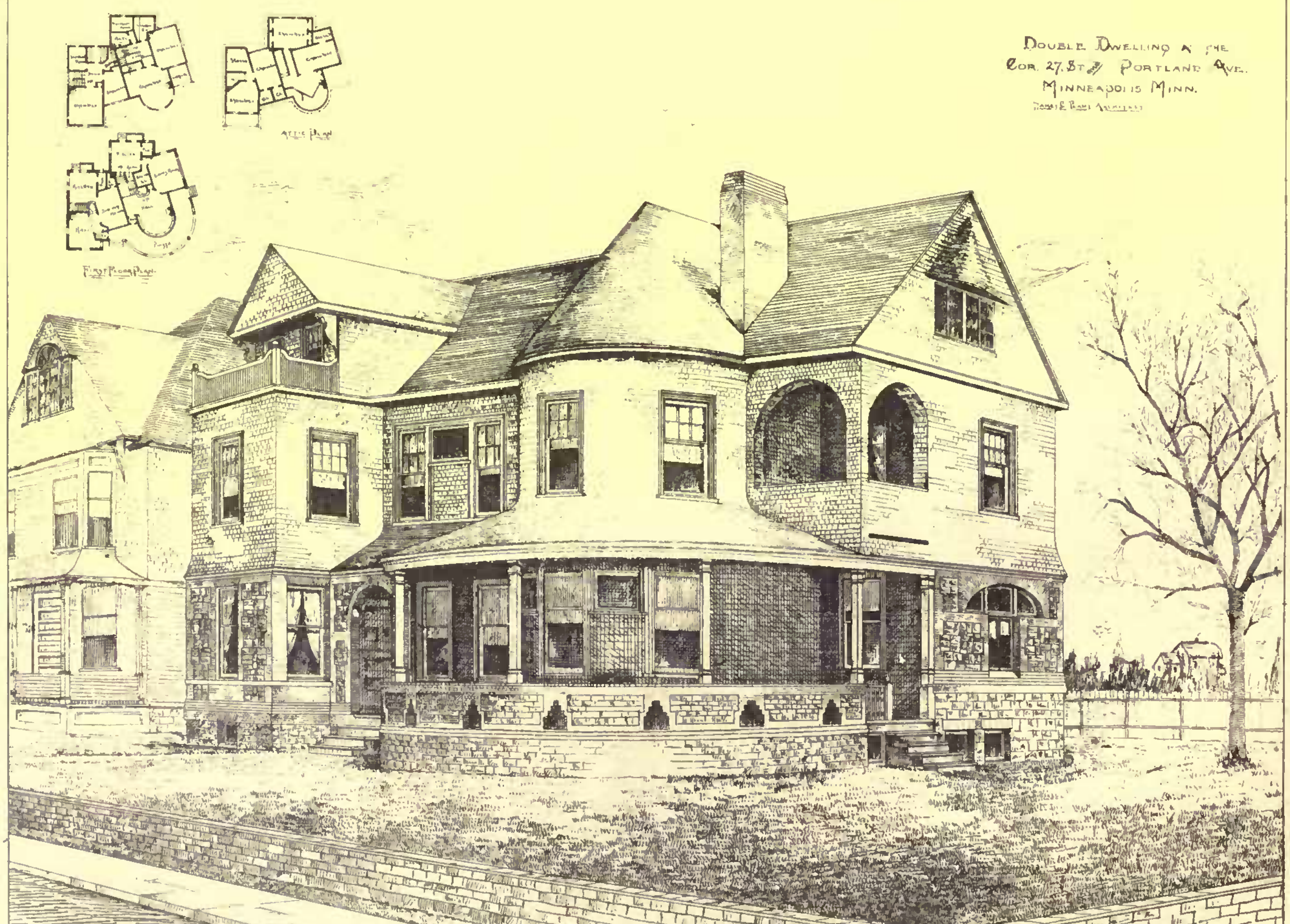


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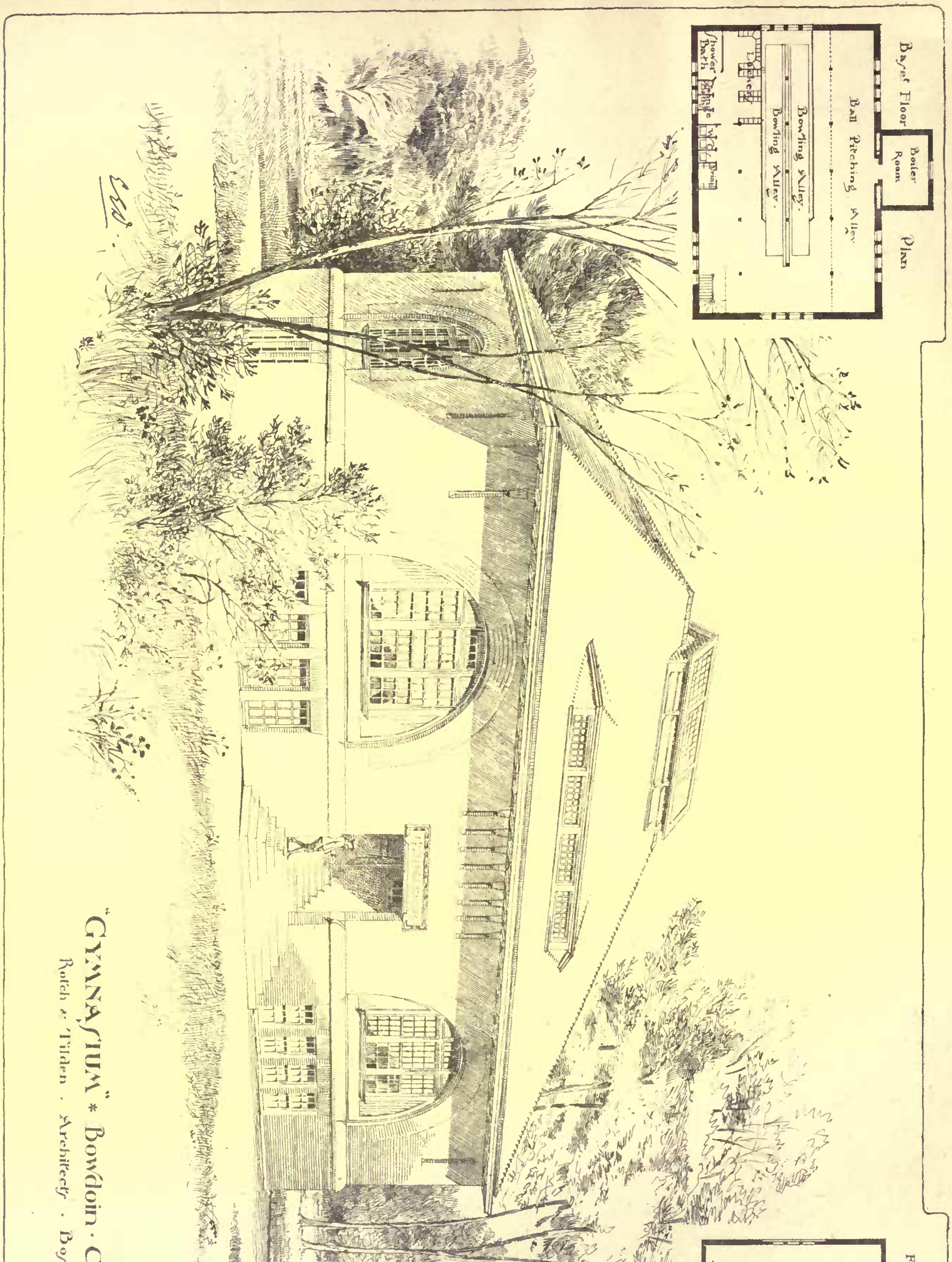
A LIFE-SAVING STATION FOR THE COAST OF NEW ENGLAND



DOUBLE DWELLING AT THE COR. 27. ST. & PORTLAND AVE. MINNEAPOLIS MINN.

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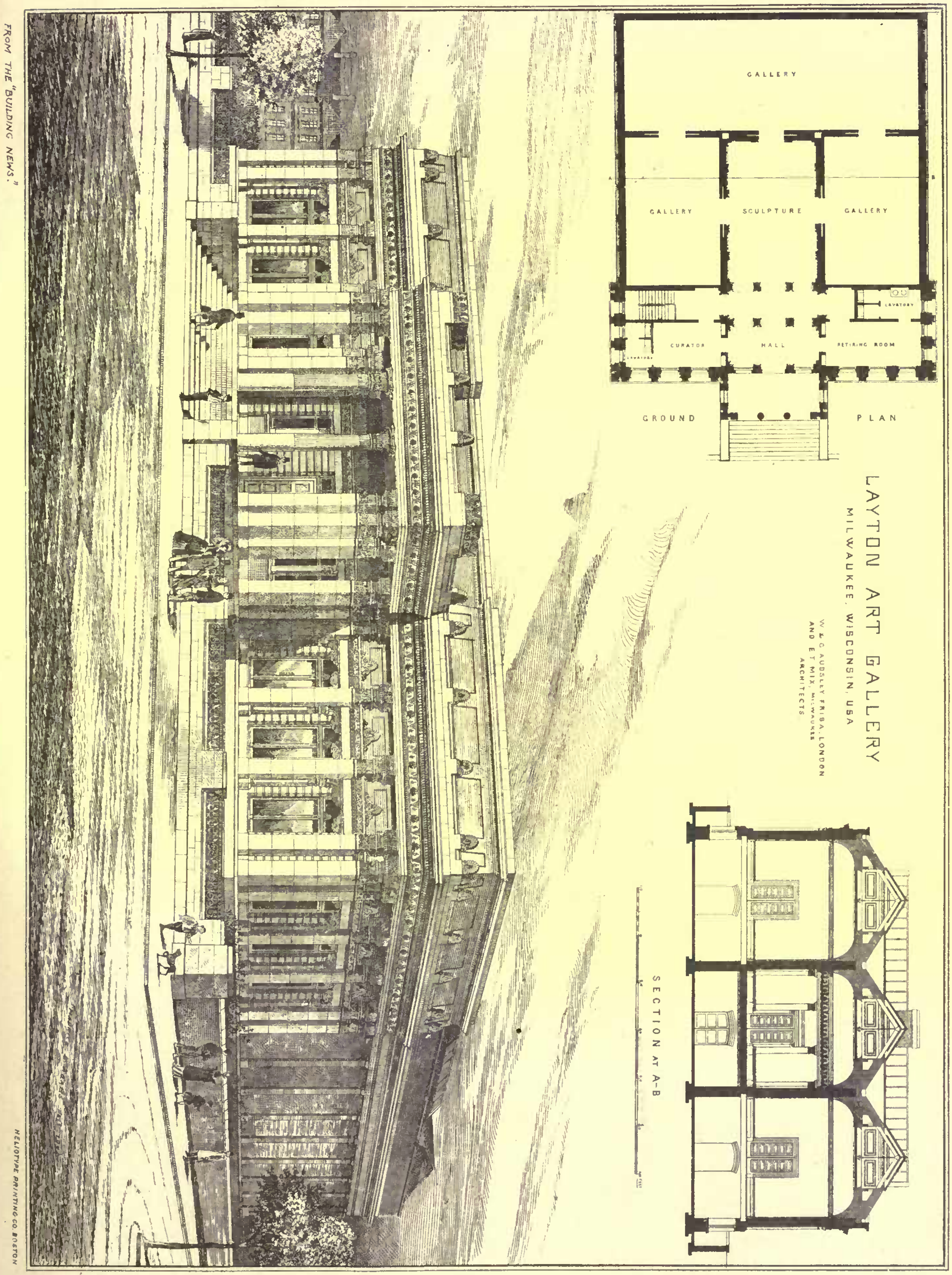


"GYMNASIUM" * Bowdoin · College : Maine *

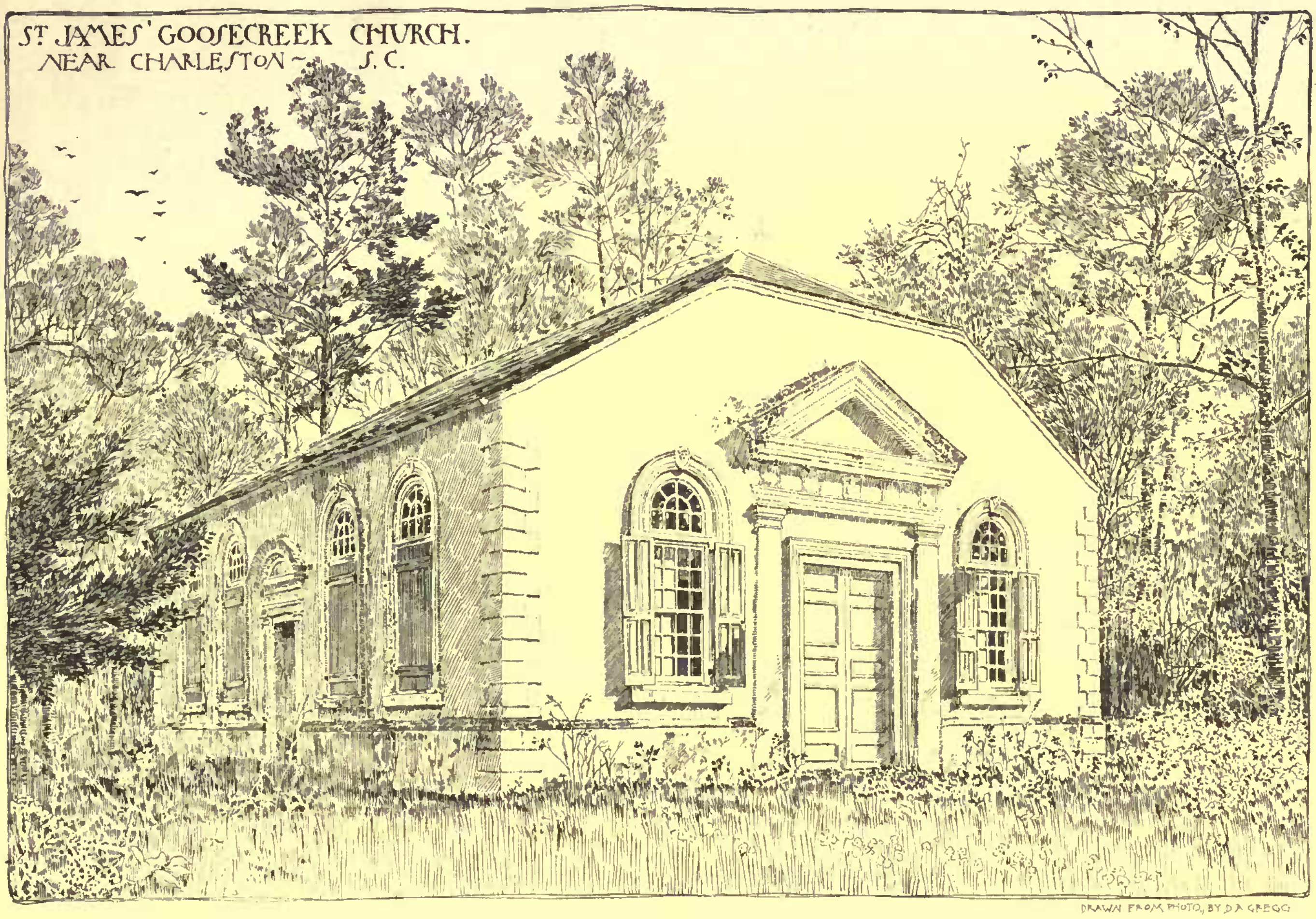
Rotch & Tilden · Architects · Boston · Mass.

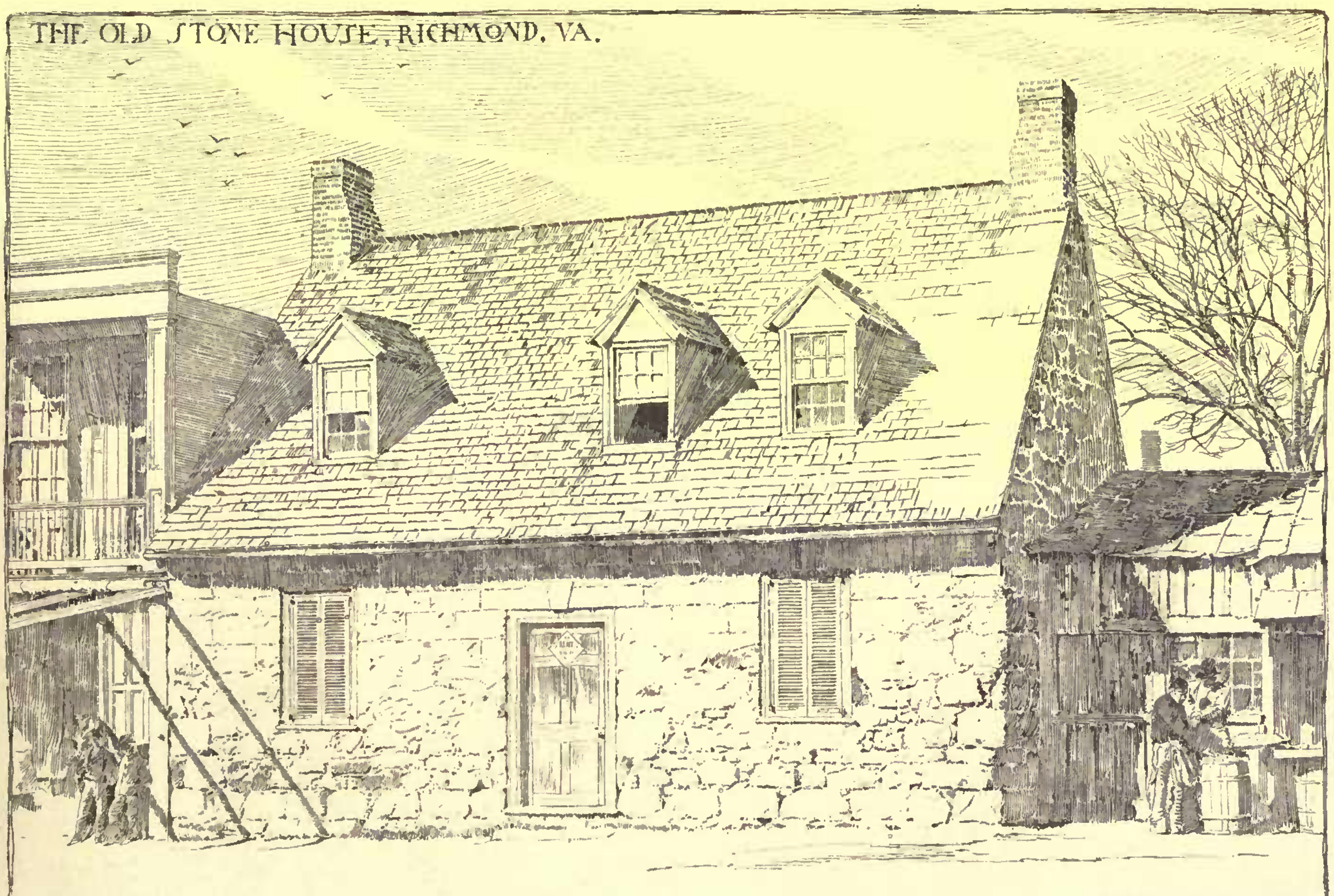
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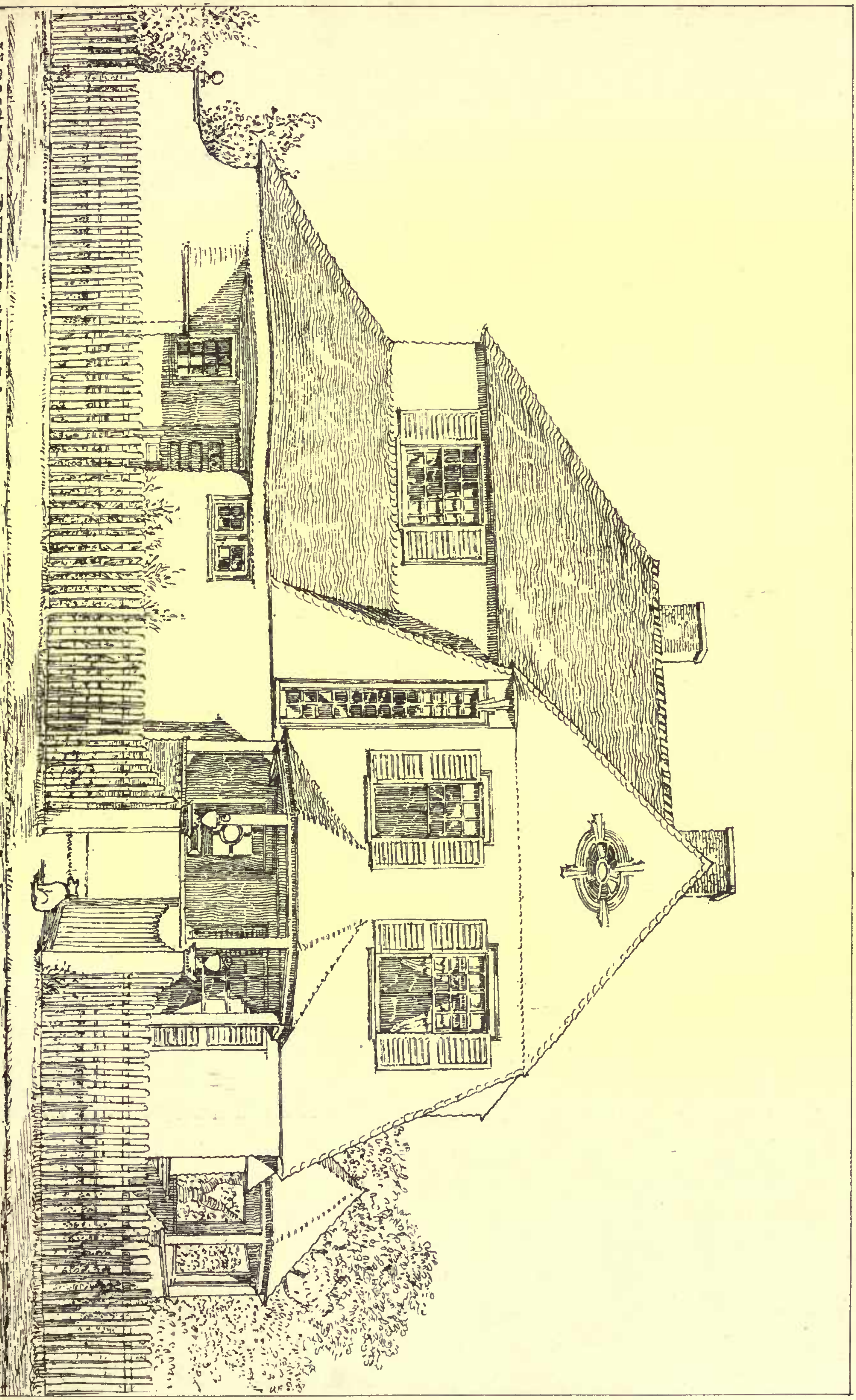
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HOUSE at PETERSHAM:
W. R. Emerson, Archt.

HELIOTYPE PRINTING CO. BOSTON

ST. JAMES'S GOOSECREEK CHURCH, NEAR CHARLESTON, S. C.

THIS very interesting old building, the church of one of the early parishes of South Carolina, is about fifteen miles from Charleston. It is thus described by Dr. Dalcho, writing in 1820: "St. James is a handsome, rough-cast, brick edifice, near Goosecreek bridge. It has four arched, sashed windows, and a door on each side, with a cherub in stucco on each keystone. Over the west door is a pelican feeding her young. At the east end is a large window, against which the pulpit is erected, having the altar in front, and the reading-desk on the right, within the rails. Upon the sill of the window is the following Scriptural quotation in letters of stucco: 'Come unto me all ye that labour and are heavy laden, for I am meek and lowly in heart, and ye shall find rest unto your souls.' Above the window is the following: 'Glory to God on high, on earth peace, good-will towards men.' The sides of the altar are adorned with four Corinthian pilasters supporting a cornice, and between them are marble tablets of the Decalogue, Apostles' creed, and Lord's Prayer; the roof is supported by four Doric columns on each side, and the walls are adorned with several handsome marble monuments, finely sculptured. Above the east window are the royal arms of England, and at the west end of the church is a large and convenient gallery. There are twenty-five large double pews on the ground floor, and the aisles are paved with flag-stones. The communion plate consists of a tankard, chalice, and an embossed plate." Notwithstanding time, and war, and the falling off in population and wealth of that section of the country, this old church is well preserved, and the above description is still accurate. There is a curious "hatchment" against the gallery at the west, placed there upon the death of Hon. Ralph Izard, one of the founders of the church.

THE RANDOLPH APARTMENT HOUSE, NEW YORK, N. Y. MR. T. M. CLARK, ARCHITECT, BOSTON, MASS.

GYMNASIUM FOR BOWDOIN COLLEGE, BRUNSWICK, ME. MESSRS. ROTCH & TILDEN, ARCHITECTS, BOSTON, MASS.

DESIGNS FOR A LIFE-SAVING STATION. BY MR. A. B. BIBB, OF THE U. S. LIFE-SAVING SERVICE.

A CORRECTION.

IT has been pointed out to us that the illustration appearing on page 303 of our issue of December 26 last, should have been styled a View in Bacharach (on the Rhine), and not Bucharest, as given.

HOSPITAL CONSTRUCTION.[1]



Cabinet Panels : Music Room : Garth House : Perths.e Scot.d ex.d by Robt Christie.

THE essentials as to the construction of hospitals may be summarized thus: As hospitals have always been due to charity, no more money should be expended on them than is necessary to secure as perfect as possible sanitary conditions. Practically, all unnecessary embellishment or architectural adornments, and all passages, corridors or staircases too wide for efficient ventilation should be avoided. All that is absolutely necessary are wards for the sick, and a definite number of rooms for attendants and stores; and the administrative accommodation of every kind should have no connection with the hospital wards.

The hospital ought to be near enough to be convenient, and situated either in open fields out of town, or, if in town, surrounded by an open space, separating it from all other buildings, never less than double the height of the highest part of the building. And it should have a cheerful, sunny aspect, and be somewhat protected from the coldest winds. The site should be dry; the subsoil self-draining and gravelly or sandy, with no nuisances or undrained or marshy ground in the vicinity. No damp, clayey soil should be built on until it is thoroughly drained. The site ought not to lie low, and thus receive the drainage of higher ground; and its natural drainage-outlets should be free, its drains ought to be at least five feet deep, and closer than in ordinary agricultural drainage—viz., about ten feet apart.

[1] From a paper read by John Eaton, M. D., F. San. Inst., at a meeting of the Border Counties Branch of the British Medical Association, and published in the *Sanitary Record*.

The foundations ought to be impervious, so as to prevent ground damp from creeping up the walls, and objectionable emanations arising from the soil. Where the blocks are two or more stories high, the materials should be fire-proof, but single-storied huts may be of wood. The walls should be hollow, in order to economize the heat in winter, and keep the wards cool in summer. The inner walls and ceilings ought to be covered with polished Parian cement, or if it is too expensive then plaster, lime-whited or painted, may be used, but it will have to be scraped off and periodically renewed. Glazed tiles, silicate-paint and soluble-glass are also recommended, but the use of anything presenting cracks or joints, or which is absorbent, is not admissible. The floors in France are usually made of flags, but in England wood, being warmer to the feet, is preferred. Oak, teak or pitch pine, or other close, hard wood, with close joints, oiled and beeswaxed and rubbed to a polish, do extremely well, or even deal floors rendered impervious by impregnating them with solid paraffin, as recommended by Dr. Langstaff, or by painting with soluble-glass as suggested by Dr. Luther, of Philadelphia, may be used. When thus properly constructed the floors do not require to be washed, which is a great advantage, but require to be well-polished once a month with wax and turpentine, periodical dusting and polishing being all that is necessary in the interval. All woodwork in the ward should also be varnished to admit of easy washing and drying. When one ward is placed over another, the floor between should be non-conducting of sound, and capable of preventing emanations from the lower wards. The Marquis de Pastoret, in his "*Reports on French Hospitals*," from 1804 to 1814, shows that there was always the greatest mortality in the upper wards of the Hôtel Dieu.

The hospital ought to be arranged in isolated blocks — one-storied pavilions, separated from each other by at least twice their height, but connected by covered ways. Each ward should be capable of complete isolation and independent ventilation, and have a free circulation of air and free play of sunlight round each ward. The general axis of the wards should run north and south, so that sunlight may fall on both sides during the day, thus obtaining the influence of the sun in promoting ventilation and preventing damp, which deposits on walls with a northern exposure. The wards should have windows on at least two opposite sides, and at each end a window to the open air, to assist in the renewal of the air at night. The side windows should extend from two or two feet six inches from the floor to within a foot from the ceiling, in order to render the wards cheerful, to permit easy air renewal, and allow patients to read with comfort, or to see out, and the best form of sash for this climate is the ordinary one which opens at top and bottom. Light can always be modified for individual patients by the blinds, which should be dark. At the Lariboisière Hospital the window-space is thirty square feet per bed, at Vincennes it is twenty-four square feet per bed, and the last has been adopted at the Herbert Hospital.

The best form for a hospital ward is that which is long and narrow; the length to vary with the number of patients to be accommodated, but the breadth should be twenty-six to thirty feet, it being difficult to ventilate thoroughly a wider ward. The wards of Vincennes Military Hospital contain forty beds, Lariboisière Hospital wards are constructed for thirty-two beds each, and so have the largest wards of the Herbert Hospital, Woolwich. The wards of the Herbert Hospital are twenty-six feet wide; St. Thomas's, London, and New Royal Infirmary, Edinburgh, twenty-eight feet; New Hôtel Dieu, twenty-nine feet; and Lariboisière, thirty feet.

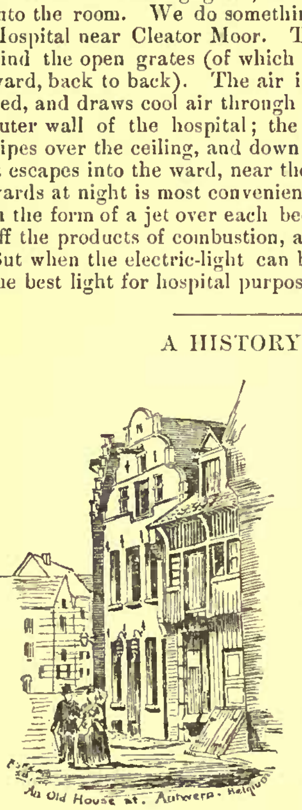
There ought to be only two rows of beds, one down each wall, with if possible, a window to each bed, and never less than one to every two beds.

The most important point in every hospital is the superficial space allowed per bed. In the best constructed hospitals it varies from ninety to one hundred square feet; the height of the ward should be from twelve to fourteen feet; the bed-space along the walls should never be less than seven feet six inches, and should be more if the locality of the hospital is a populous one; and in cases of infectious disease, as typhus, should never be less than twelve feet. Each bed ought to be allowed, in ordinary cases of sickness, four thousand cubic feet of air per hour. And as air can rarely be changed by ventilation oftener than three times an hour, the lowest cubic space for each bed is one thousand three hundred and thirty-three cubic feet, which would be supplied by one hundred cubic feet of floor space, in a ward thirteen-and-a-half feet high. The floor-space per bed allowed at St. George's Hospital is seventy cubic feet; Herbert (Chatham), ninety-nine cubic feet; Netley, one hundred and three cubic feet; St. Thomas's, one hundred and twelve cubic feet; Guy's, one hundred and thirty-eight cubic feet; New Hôtel Dieu, one hundred and four to one hundred and ten cubic feet; Fever Hospitals, one hundred and fifty to three hundred square feet.

The air may be changed in various ways; it may be drawn out by a fan, or an air-pump (Boyle's); or by a shaft containing heated air, as by ordinary fireplaces; by a caldron of water kept boiling by means of a steam-pipe; by a sunlight; or by a heated shaft connected with flues led from holes in the wall near the patients' beds, through each of which air is drawn into the shaft. And the object of all ventilation ought to be to bring fresh air in at the lowest part of the ward, warmed if necessary, and to take foul air out at the highest part of the ward through ventilators in the ceiling, or at the top of the side walls. And the fresh air would reach the patient, and the foul air be removed from him, without passing over the beds of any other.

It has generally been assumed, and the late Professor Parkes states, that the air of a sick-room or hospital should be about 60° Fahrenheit, 60° to 63° will certainly be sufficient warmth, but open fires alone cannot always yield this temperature throughout the wards. It is important to note that all diseases are more injured by foul air than by a low temperature. Typhus, enteric fever, small-pox, etc., have done well even in winter weather by almost open-air treatment. In all such febrile diseases, except perhaps scarlet fever, it is desirable to have the temperature as low as 50°, or even 45° or 40°; but chronic heart diseases with lung congestion, emphysema of the lungs, and spasmodic affections of the larynx and bronchial tubes require a warm air, and perhaps a moist one. Air may be heated before it enters the wards by passing over a heating apparatus, such as a Galton stove; or by hot-water pipes in the ward itself; by having an air-chamber around the fireplace; or by the plan of Désaguliers, proposed in 1743, to have an air-chamber round the back and sides of a radiating grate, and to pass the external air through it into the room. We do something like the last at Galemyre Fever Hospital near Cleator Moor. There large iron-pipes are placed behind the open grates (of which there are two in the centre of each ward, back to back). The air in these pipes gets heated and rarefied, and draws cool air through ventilators in the lower part of the outer wall of the hospital; the warmed air then passes along the pipes over the ceiling, and down the inner wall of the hospital, when it escapes into the ward, near the head of each bed. The lighting of wards at night is most conveniently done at present by means of gas in the form of a jet over each bed, with a special ventilator to carry off the products of combustion, as in the Edinburgh New Infirmary. But when the electric-light can be produced economically, it will be the best light for hospital purposes.

A HISTORY OF ETCHING.



THOUGH mentioned only in the second place upon its title-page,[1] the historical factors in this book are those which give it its chief interest and value. For good technical treatises upon etching have been written before, while, strange though it may seem, nothing properly to be called a history of the art had preceded this of Mr. Koehler's. Intermingled with the text of technical hand-books or of descriptive essays, we had been given, of course, many notices of many etchers, and the rise and development of the art had been considered in connection with the rise and development of sister arts in many general histories of engraving; but the part assigned it there had never been sufficiently well marked — the threads of its story had never been so thoroughly disentangled from cognate threads as to enable the special student of etching to understand its birth and to trace its progress (often a crab-like progress) through its four centuries of life. The task which Mr. Koehler has attempted was therefore well worth the effort, and it should be a source of pride to us that it has first been attempted in America — attempted, moreover, by a competent hand, and executed in a satisfactory way, written so as to give pleasure no less than instruction to the reader, and published so as almost entirely to satisfy the most exacting book-lover.

There is always a certain danger in undertaking to review a book written by a personal friend. According to one's cast of mind, or, perhaps, to one's mood of the moment, one is in danger of falling into undiscriminating praise or (through the very fear of this) of drifting into hyper-criticism. I can only trust that I shall here be able to avoid both extremes. And I have the less hesitation in thus pointing out to my readers why a grain of qualifying salt may possibly be needed to temper my words, because I am entirely convinced, in the most impersonal, impartial corner of my critical conscience, that it will *not* be applied by any reader who has seen the book before seeing this report of it.

As the title-page shows, Mr. Koehler has attempted to give no more than an outline of his subject; and, as the preface explains, he feels this outline to be imperfect even as such. There is undoubtedly a want of symmetry and balance in his treatment. Certain periods are treated with much more fulness than others, both actually and comparatively to the intrinsic (non-historic) value of their products. But no other course was possible if the volume was not to be swollen beyond those limits which now put it within the reach of the general public, as well as of connoisseurs peculiarly plethoric of purse. As it stands it is a large quarto, almost a folio in appearance, of more than two hundred pages, illustrated by thirty etched plates and by ninety-five phototypic reproductions, some of them of full-page size. The historical chapters follow upon an introduction which deals briefly with the general characteristics, aims and principles of the art, and are followed in their turn by suggestions upon collections and collecting, and then by three chapters of singularly clear technical instructions.

The author tells us that all his preparatory study was of necessity done in this country. And this fact, combined with the fact that it had to be done in dependence not upon literary testimony, but upon actual examination of the actual work of the etchers of all ages, makes one marvel a little that it could be done at all, and marvel much more that it could be done as well as Mr. Koehler has done it. Indeed he renders incidentally a valuable service in the revelation he thus makes of the riches of American print-collections — riches which of course are not comparable to those of the famous cabinets of the Old World, but yet are wealth in a true sense of the word. Undoubtedly the book would be more complete, and a few points (especially with regard to the amount of honor that should be paid to certain names on history's roll) which now are left in suspense would be more definitely decided could Mr. Koehler have carried his skilled and patient investigations into the most fertile fields of evidence. And yet the loss seems to be but small, and it is certainly balanced by a distinct gain. The book is written less from an abstract general point of view than from the point of view of the desires and needs of the American art-lover. This in itself is an advantage, while the fact that the author has gathered his evidence and his illustrations here, and the further fact that he carefully notes, in the case of each individual artist, where in America his work is represented, and in what examples and in examples of what degree of excellence, make it not only a history of etching but a full and direct guide-book for the would-be student in America. The public collections are of course open to the student, and Mr. Koehler's own experience shows that those private collections in which still greater riches are stored away are within the reach at least of those who can show any special title to be granted their inspection. (Of one private collection, by the way — of the famous Claghorn collection, which has recently passed from Philadelphia to Baltimore — we are told the gratifying news that its present possessor, Mr. Garrett, contemplates so housing and arranging it that the public may share with him in its enjoyment.)

Much more space is devoted by Mr. Koehler to the earlier centuries of etching than to its history in the last and the present century. Especially when we reach our own epoch, with its widespread and prolific revival of the art, does the treatment seem less like an outline drawing than a sketch of the slightest and most fragmentary sort. But it was certainly better to condense or omit here than in the earlier chapters; for we already know much more about to-day than about the early past, and any one who cares for the art can soon learn to know it thoroughly in its modern phase, while in its first phases it is both more difficult of access and more difficult of decipherment by the knowledge and the eye of a beginner. What was absolutely essential Mr. Koehler has given; what he has omitted we should have been very glad to have, but can better do without. And it should be added, in confirmation of this, that, writing, as I said, for Americans first of all, he has devoted a fuller chapter to American etching than to other modern developments, and also that he has spoken at some length of modern reproductive etching, because this art, as we to-day conceive of it, is in truth a product of quite recent development.

Of course every reader who has any previous familiarity with the subject will note various points to criticise in the book — not only as regards matters of taste and opinion, but perhaps as regards details of treatment also. If I am to fulfil my vow of strict truthfulness, I shall acknowledge that I, for instance, should have been glad to find the immense decorative value of the Piranesis' architectural etchings more definitely noted, and something more said about the famous iconographic series of Vandyck — something more in the way of praise and also in the way of explanation with regard to the addition of backgrounds by other hands. And there was a little disappointment, also, when I reached the pages which deal with Rembrandt. I knew how much there remained to say upon other subjects, and I knew how very easily the reader could follow up this special subject in the pages of a hundred other writers; and yet I could not but feel that, however crowded the stage, a little more elbow-room might have been accorded the great prince in whom the whole action of the story finds its centre — its historical centre, I think, and its centre of interest, I am very sure. A good deal of what Mr. Koehler does say about him is in the way of denying qualities and idiosyncracies that have been attributed to him by others. The denials are undoubtedly just, and undoubtedly were desirable, necessary even, in view of the mass of nonsense that has been said and printed by over-enthusiastic devotees. Those familiar with that nonsense and familiar with Rembrandt himself will not mistake Mr. Koehler's attitude; but a novice may possibly be led by his criticisms into a belief that his admiration for him whom he calls "the prince of etchers" is less than I venture to suppose it, or else may be left in doubt as to why he is the prince of etchers after all. For I do not think the reference Mr. Koehler makes to his powers of insight and human sympathy is the whole of the explanation, or that the rest of it is quite so clearly suggested as it might be.

The fact here indicated that Mr. Koehler is not blinded or controlled by traditional or popular or fashionable prepossessions may be accepted as characteristic of his attitude throughout. He is emphatically a historian, not a special-pleader. His sympathies go out to good work of every kind, and his judgment can see defects or limitations even where the "authorities" bid him to admire without reserve or

[1] "*Etching.*" An Outline of its Technical Processes and its History; with some Remarks on Collections and Collecting. By S. R. Koehler. Illustrated. Cassell & Co., Limited. New York, London, Paris and Melbourne.

question. This impartiality appears, moreover, not only in his treatment of etcher as compared with etcher, but of etching as compared with other forms of engraving. He is not a special-pleader in favor of the needle any more than in favor of this or that one among its wielders. And, a very important fact, he bases his history of the course of etching upon the only solid ground, illuminates it with the only clear illumination. He views his theme in the broad light of general artistic history, not in a narrow beam concentrated on the etcher's plate alone. He deals with it not as an isolated, self-dependent thing, but as a branch of that wider thing we call art in general — a branch which has drooped or withered, or budded and bloomed afresh, according as art in general has prospered or declined, and according, also, to the successive *ways* in which its fluctuations have revealed themselves.

The chapter on collecting and collections gives sound and wholesome advice and information, and in it is summed up also all that has previously been intimated with regard to our local treasuries of prints. The technical chapters are marvels of completeness and clearness combined with brevity, giving the novice as much information as could possibly be given in print with regard to the preparation, the execution, and the printing of his plates. So far as my very shallow and theoretic knowledge goes, there is no omission save as regards the process of etching in the bath.

It is much to say that in so solid and so condensed a book as this, there is not a paragraph which is dry or tedious reading — very much, when we know that the author does not write English as his native language. The fact would hardly be suspected, I think, save by a special student of literary workmanship, and then only from few and minor indications. There is never a lapse from perfect lucidity, and there is more than mere good English in the writing; there is something that is not overpraised by being called a *style.* Add to this the fact, that what I may name the author's literary manner, is unusually agreeable — as far removed from flippancy as from pedagogic dulness or impersonal stupidity — and you will guess perhaps why this most instructive volume is also most delightful reading.

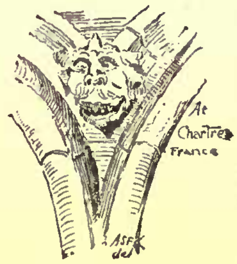
A word now as to the illustrations. The thirty etched plates were all, as I have said, procured and printed in this country. Had the fact been otherwise, some of them might have been replaced by others of greater intrinsic charm. But they are all good and some of them very good, and as the book is not a gift-book or a collection of etchings with explanatory text — as they are to be studied and prized chiefly for their *illustrative* value in the strict sense of the word — they are certainly good enough. Many of them are by American hands, and these have usually been selected to illustrate not the historical chapters, but those devoted to the explanation of various technical processes and qualities. Especially to be noted among these, for intrinsic as well as for illustrative reasons, are Mr. Peter Moran's "Scene in New Mexico" and Mr. Whistler's "Street in London." Two of the historic examples, one by Hopfer and one by Dietricy, have been printed from the original plates which curiously came to light in this country. The numerous reproductions in the text are excellently chosen and excellent of their kind, and with the text itself are handsomely printed on heavy paper. There is a full index of artists' names, but, unfortunately, no topical index.

I must add, in conclusion, that I trust no reader who contemplates possessing himself of this book will be so careless as to acquire another which bears to it some superficial resemblance. A number of etchings originally issued in the *American Art Review* have recently been collected in a volume "with text chiefly by S. R. Koehler" — who, as we all know, was the editor of the said *Review* — as a gift-book: as a collection of modern etchings, it is certainly worth having; but its value is of course not the same as that of the history now before us.

M. G. VAN RENSSELAER.

QUEEN VICTORIA'S PATRONAGE OF ART. — Some scurrilous soul sends the following despatch from London to a newspaper on this side of the ocean: "Artists in London are chuckling over a queer outcome of Queen Victoria's alleged parsimony. When her daughter, the Princess Louise, was married to the Marquis of Lorne, in 1871, her majesty determined to have the event commemorated by a big oil painting, as she has had every historical occurrence connected with her family before and since that time. The event was a notable one, as it was the first time that a daughter of the queen had been married to a commoner The scene in St. George's chapel at Windsor was picturesque and gorgeous, and worthy the pencil of Millais, Leighton, or Firth, the latter of whom had depicted on canvas the marriage of the Prince and Princess of Wales in the same chapel eight years before. But Royal Academicians charge royal prices, and her majesty favors cheap labor. An obscure painter was engaged, and he was occupied for several months upon the picture. The bride and bridegroom, the queen, and all the principal personages present at the ceremony, gave him many sittings to enable him to make the portrait accurate and the composition effective. The outlines of the pictures were just completed, when suddenly both the painter and the painting disappeared. The queen waited two years, and then caused inquiries to be made. After a long search the unfinished picture was found in a pawn-shop. The artist has never been found. Another painter was hired to finish the picture, and it has now been completed and hung in the royal gallery at Windsor. It is almost as large and quite as truthful as the famous battle-scene, depicting the duke of Connaught's heroism at Tel-el-Kebir. But the queen is angry because the total cost of the picture is far more than would have been charged by the most expensive academician."

TEHUANTEPEC AND NICARAGUA.



PRESIDENT CLEVELAND'S message, in its allusions to isthmian transit, seems to put the Nicaragua project once more into the background, and to throw a new light of promise around Captain Eads's Tehuantepec scheme. We say that the message "seems" to do this, for it is really very vague on both points. Out of the three long paragraphs devoted to this general subject it is possible for the friends of each project to extract both comfort and disappointment. But so far as one can strike a balance, the weight of executive favor seems to be with Captain Eads.

The President withdraws the proposed treaty with Nicaragua, which was the very foundation of the latest canal plan, from the consideration of the Senate. This by itself would be a knockdown blow, but later comes the alleviating statement that Chief Engineer Menocal has made a new survey of the Nicaragua route, the report and drawings of which will shortly be published by the Government. Thus the President smites with one hand, and strokes with the other. But the contradiction is only apparent. He does not criticise in any way the feasibility of the route, or even object to the idea of loaning Government money to carry on the work. His reason for refusing his endorsement to the unratified treaty which his predecessor arranged with Nicaragua is that it involves political responsibilities which, in his judgment, the United States Government has no right to assume. "I do not," he says, "favor a policy of acquisition of new and distant territory, or the incorporation of remote interests with our own. . . . Therefore I am unable to recommend propositions involving paramount privileges of ownership or right outside of our own territory, when coupled with absolute and unlimited engagements to defend the territorial integrity of the States where such interests lie. While the general project of connecting the two oceans by means of a canal is to be encouraged, I am of opinion that any scheme to that end, to be considered with favor, should be free from the features alluded to." This is not condemnation of the Nicaragua project *per se.* But it is not easy to see how the ground can be cleared for action upon the project without some such arrangement as this which Mr. Cleveland sets his face against. That Nicaragua should construct the canal herself is, of course, out of the question. That private American capital should be volunteered for the purpose, without some guaranty of official protection, seems equally impossible. But even if the capital were forthcoming, previous experiments indicate that Nicaragua would not be disposed to grant the necessary concessions without a guaranty from Washington of the canal's neutrality.

President Cleveland offers a way out of this deadlock by hinting at a universal guaranty. No distinct proposition is made, but he speaks of a line of isthmian transit "consecrated to the common use of mankind," and adds, "whatever highway may be constructed across the barrier dividing the two greatest maritime areas of the world must be for the world's benefit, a trust for mankind, to be removed from the chance of domination by any single power, nor become a point of invitation for hostilities, or a prize for warlike ambition." Still farther on he alludes again to "the necessity of a neutralization of any inter-oceanic transit; and this can only be accomplished by making the uses of the route open to all nations, and subject to the ambitious or warlike necessities of none." This is notably high ground, entirely worthy of the President and the American people at their best. That it is ground, the occupation of which is best calculated to hurry on a solution of the isthmus-transit problem is not so clear. Though there is no such intention, there may easily be a dog-in-the-manger effect to this attitude. America declines to build a canal under her own protection and guaranties. She is equally decided in refusing to allow any other one power to build it and afterward exercise protective rights. The result of this attitude may conceivably be a prompt universal agreement among all the nations to have the canal built and kept absolutely free; it is far more likely to be no canal at all. Of course it is easy to read between the lines of the message a reference to the Panama Canal. The work of M. de Lesseps is nowhere mentioned, even indirectly. The most envenomed "bear" of Panama stock could not have desired a more chilling treatment of the enterprise. But in every word said about America's refusal to assume for herself responsibilities or privileges on the isthmus, there is a clear warning to France that she must not try the thing on either.

It is most interesting to note that the President's sole expression of a desire for a speedy realization of the isthmus-transit idea follows close upon his allusion to the Tehuantepec Railway scheme. Of this he says: —

"The Tehuantepec route is declared by engineers of the highest repute and by competent scientists to afford an entirely practicable transit for vessels and cargoes by means of a ship-railway from the Atlantic to the Pacific. The obvious advantages of such a route, if feasible, over others more remote from the axial lines of traffic between Europe and the Pacific, and particularly between the valley of the Mississippi and the western coast of North and South America are deserving of consideration."

This is the only commendation given to any particular route, or

plan, and as such seems highly significant. In the same paragraph, after speaking (as quoted above) about the necessity of securing universal neutrality for the line of transit, he says: "Toward such realization the efforts of my administration will be applied." The inference seems fair that the President favors Captain Eads's plan.—*Engineering.*

BOOKS AND PAPERS.

Under its new editor *La Semaine des Constructeurs* is assuming a little more the air of an architectural journal which gives a fair amount of its attention to the artistic requirements of the profession. This is accomplished by publishing more frequently than before architectural designs. Under the admirable management of M. Planat the tendency was to devote most attention to the engineering and legal wants, rather than to the artistic. We trust that M. Daly will succeed in developing the journal in this latter direction without sacrificing its usefulness in the other two fields.

There is no comparison between the illustrated Christmas numbers of newspapers which have emanated from Paris and London. In the latter the drawings are vulgar, and the execution of them by the printer is weak and poor. Even Millais's "North-West Passage" is not above the ordinary level of commonplace chromos; and were it not for Mr. Caldecott the *Graphic* illustrations would be unworthy the notice of an artist. But the *Figaro Illustré*, on the contrary, is a rare medley of good work in design, in reproduction, and also in the high tone of its letter-press. It is true the price is *3f. 50c.*, whereas the London papers are only 1*s.*; but that is no reason for the falling off of the latter which has taken place of late years. With rare exceptions the pictures which are chosen for reproduction are clap-trap trivialities by unknown artists. On the other hand, the *Figaro* gives us first-rate reproductions of the works of Lepage, de Neuville, Roll, Worms, Tissot, and other well-known painters. Perhaps this year the publication is not quite so interesting as that of last year; but it is still excellent in quality, and profuse as regards quantity. "Une leçon de plein chant," by J. Gallegos, represents the interior of a sacristy where nine little boys, vested in red cassocks and cottas, are going through their singing-lesson from old manuscript music. The master sits in a chair beating time, while at his side are two old men playing respectively the bassoon and the ophicleide. The character in all these heads is marvellous, and the surroundings of pictures, mosaics, lamps, and the gates leading into the church, make the whole a most picturesque work. Bastien-Lepage's "Amour au Village" was never his happiest subject-picture. The horizon is uncomfortably high, and everything clashes. Taken piece by piece, nothing could be better than the painting of the man's face, his attitude, the field, and the houses behind him, or the nasturtiums in the foreground; but as a whole the work fails: everything is on one plane, there is no light, no air, no perspective, and the blue handkerchief, which rests on the fence, seems to stand up on end. All these faults are naturally repeated in the chromo, and, of course, it has not the saving merit of execution. A better choice would have been this painter's "Mendiant," a far superior work. The large "Retour au pays," by P. Jazet — a wounded seaman reciting his adventures to his family in a peasant's cottage, is good in its way, as is Worms's "Idylle à Montmartre." Casanova's "Ecrivain public à Séville" is a perfect reproduction of a pen-and-ink sketch; so, too, are the lithographs of Rénouard's "Au Tribunal" and "Au Meeting," proving the fallacy that one so often hears expressed, that the French have no sense of humor. "*Impressionisme*" is not seen at its best in Raffaëlli's "Vieux officiers," for without color the members of this school seem unable to get any effect — they cannot apparently distinguish between tone and color. A page of "Le bêtes de Paris" is a charming selection of animals, from the aristocratic horse drawing a Victoria, down to the asses with bells that tear about Paris at unearthly hours, giving their milk to customers, and a bevy of dogs, great and small, all drawn from the life by R. Goubiè. Some of the headings of chapters and little side sketches are very good, especially those by Régamey, Bér and Monvel. Last, not least, is de Neuville's "Chasseur à pied." Is there any one can draw a soldier as poor de Neuville did, if we except Détaille? And who will judge between these two great artists? Perhaps there is more character between the soldiers of different nations in Détaille's pictures; but on the other hand there is more "*chic*" in de Neuville's work; and those who saw the sketches for the panorama of the battle of Champigny, found it a difficult task to decide which of the two friends was the better workman.

S. Beale.

Tinning Sheet-Iron Between Rolls. — "Tin plates a mile long" is rather a startling announcement, yet Sir Henry Bessemer hints that the means for producing such will be his next contribution to the science of practical metal-working. His plans are not entirely made public, but in general they contemplate running the steel through the rolls and bringing it out plated with tin in sheets of any length, and then cut into plates of any desired size. The experiments are pronounced successful, and patents have been sought on the process.—*Boston Transcript.*

SOCIETIES.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

New York, January 11, 1886.

The Board of Direction of the American Society of Civil Engineers having in accordance with a resolution of the Society, appointed the undersigned as a Committee to continue the investigation into the characteristics of cements, mortars and concretes, with especial reference to their *changes in dimension* under various conditions, as to their *component parts*, their *age*, and their superposed *loads;* we would earnestly invite your personal coöperation, and ask you to forward to us any information you may have upon the subject, or which you may be able to obtain by observation or experiment; remembering always that *accuracy* is absolutely essential to usefulness. Full credit will be given in the report for all contributions that may be received.

The committee propose the following questions, to which answers are desired:

1. What is a linear *expansion* or *contraction* of cement, neat and when mixed with one, two and three parts by weight of sand (and also of various concretes), during induration and soon after the initial set?[1]

(*a.*) When subject to no extraneous pressure.

(*b.*) When subjected to different pressures.

(*c.*) How affected by the amount of water used, including an examination of grouts.

2. What is the measured compression of the same mixtures under various loads within the elastic limit, but including also that under a destructive load, at the following ages?[2]

(*a.*) After one day.
(*b.*) " one week.
(*c.*) " one month.
(*d.*) " six months.
(*e.*) " one year, etc.

3. What is the measured compression, within the elastic limit, of bricks and other lithoidal building materials, and also that under a destructive load?

4. As incidental to these, and for information only (to be placed in an appendix), what actual compressive strengths have been attained from the mixtures named, and at the several ages under head 2?

5. As another outside inquiry, can yougive personal or otlfer well-authenticated experience as to the laying of masonry successfully in frosty weather, and the methods pursued?

The Committee would offer the following suggestions as to how observations and tests should be made, and the precautions that should be observed: —

1. Measurements may be made over carefully fixed points on masonry in progress, at successive periods of time up to completion; noting thickness and number of joints, loading, character of work, kind of mortar, etc., and temperature at time of measuring. Temperatures should be noted in all experiments in which a change might introduce error into the results obtained.

2. Experimental columns may be built, and a series of measurements taken, under the varying conditions heretofore specified.

3. Prisms may be made of cylindrical or square section (preferably the former), and of dimension within the capacity of the testing-machine at hand, and carefully tested. To insure freedom from lateral flexure, the diameter should be to the length as about one to six, and for uniformity's sake this ratio is recommended.

For the load under a destructive test, cubes having two-inch sides, to be made of the same mixtures, at the same time, and tested at the same ages. One-inch cubes may be used if the two-inch are beyond the capacity of the machine, but the fact should be stated.

The readings for compression should be taken by some form of vernier, or multiplying lever, and it is desirable that they should be read to the ten-thousandth of an inch.

In measuring compressions, the attachments of the measuring apparatus should be *entirely to the* specimen, and not to the machine, so as to eliminate all errors from lost motion, etc.

The fineness of the cement used should be stated, if practicable — as found by testing a portion with a No. 100 sieve (10,000 meshes to the inch), and also the brand.

Enough preliminary tests should be made with mortars prepared by admixture of the "standard sand" recommended by the Committee on Tensile Tests, to establish a basis of comparison with the *local* sands which may be then used.

The proportions of cement, sand, and water should be determined by weight; enough of the latter being used to make "a stiff, *plastic* paste, the cement and sand being mixed dry, and the water added all at once."

The moulds should be filled from the end, rammed lightly with a wooden stick of one-inch diameter, at about each three inches of height; when full, submitted for a few seconds to a weight on the upper surface equal to five pounds to the square inch of section, and then smoothed off with a trowel.

[1] In making these observations, the action of induration should be closely observed, to determine whether there may not be a *preliminary* expansion and subsequent contraction, or the reverse.

[2] It is desirable that briquettes for tensile tests be made from the same mixtures and tested at corresponding times for purposes of comparison.

The test-pieces should not be immersed in water, unless it be found by experiment that the accuracy of the tests shall be vitiated by the development of cracks.

Great care should be taken to insure accurate contact between the end surfaces of the test-pieces and the plates of the machine, thin strips of soft wood, about one-fourth thick, being recommended for this purpose.

In the use of wood for this purpose, it is found to introduce error, however, by causing *premature splitting* in the direction of the grain of the wood, *except the following precautions be taken*, viz., to use a socket of say five-sixteenths inch depth, with a diameter of say one-fiftieth inch more than that of the test piece. This not only confines the wood and prevents the splitting action, but serves as a ready means of accurately concentrating the test-piece in the machine.

Experience may indicate changes in the suggestions here made, in which case a supplementary circular will be issued.

It is particularly requested that all details of experiments be fully given, including the kind of machine used, and everything bearing on the accuracy of results.

Please address replies or communications to F. Collingwood, Chairman, care American Society Civil Engineers, 127 East Twenty-third Street, New York.

F. COLLINGWOOD,
D. J. WHITTEMORE,
THOMAS LINCOLN CASEY, } *Committee.*
A. V. ABBOTT,
GEORGE F. SWAIN,

THE KANSAS CITY SOCIETY OF ARCHITECTS.

THIS Society was organized in April last, and began with a membership of twenty-one local architects. Since its organization four new members have been added, and two of the original members have been stricken from the roll for cause, leaving a present membership of twenty-three.

The regular meetings of the Society are held every Monday, at 4 o'clock, P. M., and since its organization there has been an average attendance of twelve members at each meeting.

As yet this Society has done but little in the way of reading of papers, but we anticipate the coming season that something interesting in that line will be done.

The meetings thus far have been strictly harmonious; and to the genial, social feeling which exists among the members is attributed the cause of so few discussions or papers on matters relating to the profession.

About two months ago the Society rented and furnished a room for its meetings, and recently rented an adjoining and connecting room, which it is having fitted up with shelving for the exhibition of building materials and appliances by manufacturers and agents, who so desire to exhibit their wares. For this privilege a nominal sum will be charged by the Society.

It is believed that this arrangement will be a benefit to all concerned, as it relieves those having such goods for sale from the trouble and expense of sending a sample or a model to each architect, and it relieves the architects from the annoyance of having their offices lumbered up with such articles, as none in this city have facilities for showing to advantage the wares which are sent them from time to time. As there are only about two hundred and fifty square feet of space available for exhibition purposes in the Society's room, only the smaller articles will be admitted, and the space allowed to each exhibitor will be necessarily limited. Further information regarding this feature will be furnished by the undersigned on application, either in person or by letter.

A committee has been appointed by the Society to select a list of architectural and scientific periodicals to be subscribed for by the Society, and kept on file at its rooms, which will comprise such publications as are not usually subscribed for by the individual members.

A committee has also been appointed to establish a more perfect system of measurement of stone and brick work, in cases where contracts are not let for a round sum, than that which has heretofore been customary. F. B. HAMILTON, *Secretary.*

RUSKIN'S "EXAMPLES OF THE ARCHITECTURE OF VENICE." — It is probable, says the *Pall Mall Gazette*, that another of Mr. Ruskin's early works will, before long, be re-issued, namely, the "*Examples of the Architecture of Venice*," which were originally published to supplement on a larger scale the illustrations in the "*Stones of Venice*." Owing to the lack of encouragement at the time, only three parts out of twelve were published, and these are now very scarce. Only fifty sets of proofs were printed, and more than once in recent years as much as £30 have been paid for a set of India proofs. The print copies also are very difficult to get. There were ten steel plates, some in line and some in mezzotint, and all these are still in excellent condition. The six lithographs will be carefully done again, as the stones were destroyed. It is further said that Mr. Ruskin hopes to get the remaining three chapters of "*Præterita*," which will complete the first volume of his autobiography, finished and out by his birthday on February 8th next, and that the whole of the special edition of the "*Stones of Venice*," on large hand-made paper, announced a few weeks ago, has been taken up, and that the publisher has been obliged to close the list.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

BOOKS ON GRAPHIC ANALYSIS.

NEW YORK, January 13, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you kindly advise me what book or books have been used as reference in determining graphic strains in trusses and for thrust of arch, in "*Building Superintendence*," and oblige,

Yours respectfully, GEORGE MARTIN HUSS.

[The methods described in "*Building Superintendence*," for determining strains in roof-trusses are to be found in Green's "*Graphical Analysis*," Lanza's "*Applied Mechanics*," Kidder's "*Architects' and Builders' Pocket-Book*," and other works. The method for arches is essentially Scheffer's method, as given in most books on applied mechanics, simplified and abbreviated in the way shown in a paper by Mr. Kidder, published, we believe, in "*Carpentry and Building*." — EDS. AMERICAN ARCHITECT.]

THE SAVANNAH JAIL COMPETITION.

SAVANNAH, GA., January 14th, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In your issue of January 9 I notice a letter from a correspondent signed "*Pis aller*" on the Savannah Jail Competition, and as I have had inquiries also on the same subject, it seemed to me best, with your permission, to use your valuable columns to answer such.

In conversing with one of the county commissioners this morning, I mentioned "*Pis aller's*" case, as set forth in your columns, and the gentleman said he was quite sure that the chairman, Colonel R. P. Walker, had never received the letter, or he would have replied to it, either personally or through his clerk. But he said there was to be a meeting of the board to-day and he would hunt up "*Pis aller's*" case.

It may interest competitors to know that the Commissioners have selected the designs of McDonald Brothers, of Louisville, Ky., after a long delay, caused partially, at least, by the property owners in the vicinity of the proposed site getting out an injunction restraining the Commissioners from proceeding with the erection of the jail. This was done by Judge Roney of Augusta in the absence of Judge Adams who, on his return to the city about the middle of November last, decided not to grant the petitioners' prayer. The commissioners, being thus relieved from all restraint, immediately proceeded with the examinations of the plans, and yesterday selected the one as announced above. No prize other than the regular five per cent commission was offered to the successful competitor. There was quite an array of designs sent in, if reports are true, but sixteen sets only were deemed of sufficient merit to have a close examination.

J. J. N.

A QUESTION OF COMMISSION.

CANTON, MASS., January 4th, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Having seen many of your discussions on the relative rights between architects and clients, I venture to ask your opinion upon a matter within my own experience.

Eight years ago I got out a set of plans and specifications for a house estimated to cost $7,000 above the foundations — for a client who intended building at once. The matter however dragged along without action on his part, more than to obtain estimates, and without charge on mine, I thinking, from time to time, that he would build soon, and being a young architect not liking to make a charge until something was accomplished. So the matter stood until within a few months, when my client came to me and wanted new sketches, his wants and the styles having changed somewhat in the meantime. Thinking that now he at last meant business, I made one-eighth inch scale sketches for an entirely new scheme and submitted them.

In a few days they were returned with the information that "he had seen other plans which he liked better," and which he intended to adopt.

I immediately sent him a bill for two per cent of the estimated cost of the first set, that being a fair percentage, I judged, on specifications and quarter scales — without full-size — as that set was constituted.

I made no charge for the latter sketches, although he gave me not the slightest hint that he intended to go into competition, and now he demurs from my charge.

What I would like to know is, was my charge too much or too little?

The information I have always received through the *American Architect* has been through the answers to communications. I have no objections to having this printed, but should hardly consider it of moment enough to print. If it comes within your province to answer such a question you will greatly oblige

Very respectfully yours,
G. WALTER CAPEN.

[We should consider the charge too small. — EDS. AMERICAN ARCHITECT.]

THE HOFFMANN CONTINUOUS BRICK-KILN.

CHICAGO, ILL., January 11, 1886.

To the Editors of the American Architect: —

Dear Sirs,— In answer to the inquiry of Messrs. Bauer & Hill, architects, in your paper of the 9th inst., I would state that the "Hoffmann Continuous Brick Kilns" are operated by Messrs. Egelhoff & Brother, Louisville, Ky.; New Orleans Brick Company; Jefferson, New Orleans, La.; Henry Maurer, Perth Amboy, N. J.; and some others. It is safe to say that the Hoffmann Kiln will operate with at least thirty-five per cent less fuel than the common old-style brick-kiln. Yet there are some decided disadvantages about its system that will fully balance the gain for United States adoption.

The kiln is recommendable where labor is cheap and fuel very high-priced, and a common brick, regardless of how much discolored by firing (or burning), will answer the market.

Respecting brick-machines, I would say that the "Whittaker Semi-Dry Brick-Press" (patented in the United States in 1884), is superior to all other machines ever made. It will work clay in all conditions of moisture and dryness, or green from the bank if desirable, into most perfect pressed and moulded brick; further, it is the most economical working-machine in the world. It would be too lengthy to treat the kiln-and-machine subject here in detail. Any particular information wanted will be cheerfully given on applying to

F. P. Meyenberg,
Consulting Engineer for Brick and Terra-Cotta Works.

[We wish that all questions which our own lack of information compels us to "refer to our readers" might find those who have the knowledge willing to impart it as fully and satisfactorily as our correspondent in this case. — Eds. American Architect.]

NOTES AND CLIPPINGS

The Mutual Defence Association. — The "Caisse de Défence Mutuelle des Architectes" has made up its list of officials for the year 1886 as follows: — President, M. Bailly, President of the Société Centrale, etc.; Vice-Presidents, MM. Achille Hermant, F. Rolland, and Dormoy, of Bar-sur-Aube; Treasurer, M. Faydeau; Vice-treasurer, M. Bartaumieux; Secretary, M. Charles Lucas, Assistant-secretary, M. Tournade; Honorary member of the Committee, M. Questel, Past President. The Caisse, which was only founded last June, already counts its hundred members in Paris, seventy members in the departments, and ten associated societies — *The Builder.*

Coincidences of London Nomenclature. — In London there are two "Houses," two "Rows," two "Lanes" and two "Streets." In the west end, "the House" is the House of Commons; in the city, "the House" means the stock exchange. In the west end, "the Row" means the ride in Hyde Park; and in the city it means Paternoster Row, the headquarters of the book-publishing trade of the world. In the west end, "the Lane" means Park Lane, the headquarters of upper tendom; in the city, "the Lane" means the Mincing Lane, the headquarters of the produce trade of the world. In the west end, "the Street" means Oxford Street, a great shopping thoroughfare many miles in length; in the city, "the Street" means Throgmorton Street, a very narrow, very short thoroughfare, where outside speculators love to congregate. London's weak points are "hills." There is nothing loftier within hundreds of miles than the hills of Highgate, Hampstead, Corn, Snow, Richmond, Holburn and Ludgate — all of which are over-topped many times over by Dumbarton Castle, not to mention the Bens of Lomond and Nevis. — *Boston Transcript.*

December Fire Losses. — The New York *Daily Commercial Bulletin* of Jan. 5 estimates fire losses in the United States and Canada during December at $9,200,000, and the aggregate loss during 1885 at $94,200,000, or $15,000,000 less than during the previous year. The last six months of 1885 have shown a much lighter loss than the first six months, thereby enabling the insurance companies to come out even, and, in some instances, to make a profit, on the business of 1885.

Giotto's Work on the Florence Campanile.—As the architects of the Renaissance were not blessed with illustrated journals, it is not surprising that people are growing sceptical about their capabilities, and that occasionally one finds a great man made to appear as a daw in borrowed plumes. It is now the turn of Giotto, who has had a long spell of admiration for his Florentine Campanile. According to the *Courrier de l'Art,* Signor Mospignotti has been ferreting among the records, and he has come to the conclusion that all that can be credited to Giotto are his panels near the ground, which symbolize the arts and sciences. It may be true that Giotto began the work, but the signor says that the original design, which is suggested by an existing drawing, was entirely different to what has been constructed, for Giotto's architectural skill was of an inferior quality. Instead of faithfully carrying out the design of Giotto, his successors departed from it. Andrea Pisano is supposed to have continued the work. Between 1350 and 1358 the sole architect of the Campanile and the Cathedral, according to Signor Mospignotti, was Francesco Talenti. According to Marchese, a mason of that name was employed on the cathedral of Orvieto in 1327; afterwards he studied architecture under Fra. Campi, and produced much of the ornamental work on Sta. Maria Novella. Fra. Jacopo Talenti was the architect of a great part of that church, and is said to have been much employed by the commune. But the connection of any of the family with the Campanile has been overlooked, although mentioned by Pucci. It may be mentioned that in 1882 Mr. P. E. Macey maintained in this journal that the architect was Arnolfo di Lapo — a supposition which gave rise to some correspondence.—*The Architect.*

Philadelphia Architecture.— R. J. Burdette thus hits off Philadelphia: It was one of the pastor's best sermons, and he was describing Heaven. It was a place of marvellous, matchless, transcendent beauty, he said. All the mansions were of red brick, with solid white shutters four inches thick, no cornice, brass door-knobs, and white marble steps, with angels continually scrubbing them through the countless ages of eternity. "Eloquent preacher," said the stranger in the deacon's pew, at the close of the service. "Philadelphia man, ain't he?" "Ah," said the deacon, "somebody told you."

TRADE SURVEYS

During the past few days, manufacturers of building material and dealers in lumber, iron, hardware and machinery for certain uses, report having received liberal orders for execution between March and June next. So far as it has been possible to ascertain definitely the actual facts and their meaning, they go to substantiate recent assertions relative to exceptional activity during the coming season. Any one who desires to familiarize himself with prospective railway operations can find enough material for an optimistic opinion in the railway journals, without seeking corroborative testimony from the controlling spirits in railway enterprise. The probabilities point to a railway boom of no small proportions, in such States as Kansas and Texas, and in the Northwest. Investors in our financial centres are impatient. More capital is seeking than will find employment. Railroad material supply concerns, and dealers in lumber and shop appliances, have booked rather extensive orders within a week, footing up into such totals as thirty thousand tons of steel rails, besides spikes, splice-bars, nuts, bolts, ties and large railroad hardware; contracts for cars, station and shop furnishing, etc. The structural iron-makers have closed contracts for two thousand eight hundred tons of bridge iron, and Chicago and Bay View lumber dealers have recently booked orders for lumber reaching into millions of feet, for railroad construction, with Chicago, St. Louis and Duluth as termini.

These railroad facts are mentioned simply to indicate what the railroad builders are doing. The rail mills are safe if they should not book an order for four months. The bridge-iron makers and bridge builders have more negotiations in hand than for years, a statement safe to make. Inquiries have been made for bridge work projected across the St. Lawrence, Mississippi and Missouri, besides several smaller streams. All this has both a direct and an indirect influence on the building trades, in the creation of an enormous demand for iron, steel, lumber, stone, and a score of other products which enter into building. The effect of an active railroad demand on building material would be, of course, to strengthen prices. Last year nearly forty-five million dollars were expended for building-stone, lime and cement — an amount equal to almost the total product of the silver mines, one-half more than the value of the gold output. An advance of ten per cent on building-stone, lime and cement is no insignificant item. The statements of builders in the New England States and Middle States, concerning summer prices, seem to harmonize. Contrary to much newspaper prediction, they do not anticipate any material advance, and furnish reasons apparently sufficient. The improvement that has taken place has been, they say, simply the natural reaction from undue depression. This reaction has stimulated greater production in many lines, and has encouraged producers generally. Hence the increased output will protect building interests. The correctness of this view has been already supported by the latest iron trade developments. Prices have halted. Manufacturers feel that further hardening will jeopardize them. The entire industrial situation shows that anything of a "booming" nature, anything that threatens speculative values, any influence that works to bring about undue production will be checked. If the depression has taught the country this much, it was worth its cost.

This week's reports from several interior New England towns shows moderate activity among architects. The chief work in hand just now is for manufacturing enterprises. The machinists, engine and loom makers; and makers of machinery generally in New England, are favored at present, rather than the architects and builders, although architects in Lynn, Worcester, Springfield, Hartford, Providence and two or three other cities have knowledge of considerable house-building enterprises that are in a smouldering state.

The architects of New York City and of the larger cities and towns of that State have received instructions to prosecute important work on factories, shops and large apartment-houses.

The list of incorporated companies for the past twenty days shows no decadence in the spirit of enterprise. Supply-houses, in view of the active demand for all kinds of material and supplies, have made inquiries for prices, and opened negotiations with a view to early action, should the healthful tendencies continue a week or two longer.

Philadelphia architects have abundance of work on hand. Pittsburgh will take a fresh start, aided by the stimulus of natural-gas, which is attracting many thither, in view of the economic advantages to be realized from the use of this cheap fuel, Some seven hundred miles of additional pipe-line are projected, on paper, at least.

The skelp mills are well sold up. The wrought-iron pipe makers met in Philadelphia recently, and renewed old prices. The bar and rolled iron makers met and advanced prices. The brick-makers in Western Pennsylvania have formed a compact organization and advanced prices. Lath, shingle, sash, door and blind manufacturers in the more remote West, purpose similar action. The builders and hardware manufacturers have discussed combination of an effective sort, but competition still depresses prices.

In Chicago, a fair volume of work is hand. Favorable reports are received from St. Louis. Municipal impro ments in a great many Western cities and towns, will constitute an im rtant factor in this year's activity among architects and builders.

The makers of mining machinery are quite busy. The car-builders all have crowded works and pressing orders. Locomotive builders, though more active than last year, still complain.

The business of furnishing electric-light plants, water-gas plants and supplying natural-gas requirements, and gas-machines and machinery, is gaining in proportions. The water-gas system already extends into over one hundred and fifty cities and towns.

The year opens with every influence in favor of exceptional activity. With the light of past experience, it is to be hoped that the mistakes due to rash judgment may be avoided.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. NO. 527.

JANUARY 30, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

THE death of the great French painter, Paul Baudry, is particularly notable from his connection with the mural decoration of the Paris Opera-house. Every one knows that the architect of the Opera, Garnier, is passionately fond of color-decoration, and he entrusted the ceiling of the foyer, which he made the centre of his color-composition, to Baudry, who had already gained a high reputation as the self-taught winner ot the Prix de Rome, and the painter of many noted pictures. The ground of the foyer is gold, or imitation of gold, almost throughout, and it opens on one side through a colonnade into the avant-foyer, which is decorated in mosaic, so that Baudry's paintings have as rich a frame as could well be imagined, and their splendor fully justifies the richness of their surroundings. On these pictures he spent all his time for eight years, after preparing himself by study of the great Italian frescoes, and upon them his fame principally rests, although many other decorative paintings were either executed by him on the spot, or were, as, for instance, those in the Vanderbilt houses in New York, painted in the studio, and subsequently set in ceilings prepared for them.

JOSEPH MILMORE, brother of the late Martin Milmore of Boston, and associated with him in most of the works of sculpture which have brought high reputation to both, died in Geneva on the seventeenth of January. The four Milmore brothers, of whom only one is now left, although born in Ireland, were taken to this country when very young, and were brought up as thorough Boston boys. All of them were unusually clever, and in much the same way, and, by their own efforts and each other's help, were able to raise themselves from a very modest station to distinction and comparative affluence. Although circumstances brought Martin, the older, into more prominent notice, through the success of his designs for the Boston Soldiers' Monument, the Horticultural Hall statues, and some others, Joseph was his constant and most valued assistant, both in this country and in Italy, and executed also some works of his own, which were little, if at all, inferior to those of Martin. We have ourselves some slight recollection of both the brothers. Martin we first knew as a student in the drawing-school where we gained our first ideas of the proportions of the figure. He was even then a person of considerable note, and we can still recall the veneration which we felt for the tall man, as he seemed to us then, who wore light-colored clothes and had his name in the newspapers. As we recollect him, he was an extremely quiet, industrious student, and, although he usually had a little crowd about him during the intervals of rest, his steady devotion to his work never seemed to be disturbed. Joseph, whom we had occasion to see some years later, although he seemed to us a smaller and less imposing person than his brother, had the same quiet, unembarrassed and unpretending manner. Nothing could be more unlike the make-up of the fashionable sculptor than the dingy clothes and generally dusty appearance which characterized him when at work; but his business, as he conceived it, was to get beautiful forms out of stone, and knowing, as Michael Angelo did, that the way to accomplish this was to cut and hammer away the dead matter which hid these beautiful forms from view, not to dance daintily around his block with a velvet coat and patent-leather boots on, he would have lived in dust up to the chin rather than fall short of the ideal which he had placed before him. Although the Italian taste in sculpture, and the theories on which the Milmores formed their style, have rather gone out of fashion now, thanks to the loathsome caricaturing from which they have suffered since a demand for cheap soldiers' monuments arose, much of their work will always challenge the respectful attention of artists, and their fellow-citizens have good reason to be proud of the achievements of the poor boys whose love of beauty developed them from cabinet-makers' apprentices, first into ordinary marble-cutters, then into sculptors of a reputation little inferior to that of any others of their country and time.

THE *Builder* contains a report of a remarkably clever essay, read before the English Architectural Association by its Vice-President, Mr. J. A. Gotch, on Dwelling-Houses in the Seventeenth Century. There is no question that the art of designing beautiful, lovable and stately homes was better understood and practised in England at that time than in any other country before or since, and everything relating to the examples that still remain to us ought to be assiduously studied by all who wish to excel in domestic architecture. According to Mr. Gotch, the revival in this art in the seventeenth century was a consequence of the general intellectual impulse which, all over the world, followed the invention of printing and the Reformation; but this impulse happened to take the form of an advance in the art of house-building in England more than elsewhere, partly through the new feeling of security and peace which followed the repulse of the Spanish invasion, and partly on account of the sudden wealth which came upon the nobles and gentry through the confiscation and distribution of the estates of the convents and clergy. The English of the preceding age had been fond enough of their homes, and many of the fourteenth and fifteenth century manor-houses are charming in their way; but in these rude times almost everything was sacrificed to defence, and it was not until Elizabeth's reign that a baronet or esquire could venture to open wide doors and windows to the sunshine which the English prize so highly.

EVEN in the happy and prosperous seventeenth century the tradition of a fortified enclosure in front of the mansion was usually retained, and almost all the large houses, like the aristocratic French mansions to this day, were preceded by a court-yard, which was surrounded on three sides by kitchens, sculleries and stables, and was entered through a gateway protected by a porter's lodge. At the farther side of the court-yard, opposite the entrance gate, was the mansion, with front, side and rear walls broken everywhere with those delightful mullioned bay-windows characteristic of the style. Except for the string-course mouldings, which were usually of a semi-Roman character, and the pilasters and pediment which sometimes adorned the doorway, there was at first little to suggest the classic Renaissance in the exterior; but, as time went on, balustrades and plinths began to appear on the parapets, and the chimneys, from the nondescript twists and flutings of the earlier days began to be decorated with pilasters and entablature. Here and there a niche, varied from the familiar Gothic type by the insertion of a shell in the top, relieved a heavy bit of wall in the façade, and occasionally contained a piece of "commercial sculpture" in the shape of a statue. Under the porch, which in the later examples became an important and richly-decorated feature of the building, opened the main door, a heavy plank construction, dotted with square-headed nails, and furnished with a knocker consisting of an iron ball, hung from the upper part of the door by a chain long enough to allow the ball to strike against one of the larger nails. This door opened into a long corridor, usually about five feet wide, which extended across the house to the opposite side, where there was usually another door, opening upon the garden or orchard. One side of the corridor was formed by a wooden screen, which

separated it from the great hall of the mansion, and two doors usually opened through the screen into the hall. The other wall of the corridor was of stone or brick, and formed the separation between the servants' parts of the house and the master's portion; and doors were arranged in this, as well as a "batch" into the "buttery" and pantry, through which dishes were handed to the butler and his assistants. The ceiling of the corridor was formed by the floor of the minstrels' gallery, which opened into the great hall. This, we need not say, was the principal apartment of the house, occupying its whole width, from wall to wall, and extending to the roof, the carved-oak trusses of which were often left visible. Great mullioned windows, with colored coats-of-arms set in the expanse of leaded quarries, occupied nearly the whole of both sides of the room, and there was commonly a deep bay-window at one end, forming the termination of the raised dais, or platform, five or six feet above the general floor level, which occupied the portion of the hall farthest from the screen, and served to give dignity to the appearance of the groups of those particularly honored guests who were invited to occupy it. A large fireplace was always built on at least one side of the hall, and toward the dais end were the doors which led to the other family apartments. These, in large houses, generally included summer and winter parlor, a "withdrawing-room," and often a dining-room, separate from the hall, and a smoking-room, where the gentlemen of the day practised the new trick which Sir Walter Raleigh had just brought from the American wigwams. In some cases a chapel and chaplain's study were added to the rest, and mullioned bays admitted a flood of light everywhere. Staircases were as liberally provided as in the modern English mansions, which is saying a good deal, and were of all varieties, from the corkscrews in the turrets to the broad, easy stairs, with richly-carved balustrades, which still delight us in Nash's pictures. They possessed, however, one advantage over the modern stairways, in being always placed next an exterior wall, so as to be lighted by large windows. The upper stories were occupied by bedrooms, as interesting in their way as the apartments beneath them, and always lighted in the picturesque manner characteristic of the style. The hall of course cut off the bedrooms over the kitchen and offices entirely from the family rooms on the upper floors; but there was space enough for valets and maids to sleep within call of their masters and mistresses on the family side of the house, while the rooms on the other wing accommodated the out-door servants and kitchen people, who were not obliged to wait upon any one at night.

ENGINEERING gives some details of the Flood-Rock explosion, which apply more particularly to the operations that architects and builders have to deal with than any we have seen. Every one knows that the explosive principally used for blowing up the ledge was "rackarock," which certainly proved itself a valuable substance; but every one may not know that this "rackarock," instead of being a preparation of nitroglycerine, like dynamite and giant powder, is simply a mixture of chlorate of potash and nitrobenzole. Nitrobenzole is a cheap, harmless, aromatic fluid, easily prepared from naphtha by treatment with nitric acid, and the mixture with crystals of chlorate of potash was, in the Flood-Rock operations, made on the spot, for greater safety. The chlorate of potash, in small crystals, was first sifted and then mixed with the liquid ingredient in a lead-lined vat. The mixture, which resembled moist brown sugar, was then put into copper cartridges, two feet long and two and one-half inches in diameter, and tamped with a wooden mallet. As the cartridges were to be submerged, it was necessary to close them hermetically, and this was done by soldering on a copper cap. It may be imagined that the soldering of cartridges containing six pounds each of such a terrific explosive would be nervous work; but the danger was reduced to almost nothing by providing a very fusible solder, which could be melted by a jet of steam. Although the risk from the application of ordinary solder and soldering tools would have been considerable, the steam jet was not quite hot enough to determine an explosion, and the forty thousand cartridges were charged without a single accident. The contract for the rackarock specified that it should have ninety per cent of the strength of No. 1 dynamite, which is the most powerful variety, and consists of three parts nitroglycerine to one of infusorial earth; but tests showed that, as made on the ground, it was more than one-fifth stronger than the contract required. After placing the rackarock cartridges in position, six hundred firing cartridges of dynamite were placed in such a position that each should have a group of the smaller ones about it, to be exploded by sympathy. It is usually assumed that cartridges of this kind will be fired with certainty by the concussion of a detonation taking place anywhere within twenty-five feet; but General Newton was unwilling to take any chances in his work, and none of the rackarock was placed more than twelve and one-half feet distant from the dynamite cartridge, intended to explode it. The latter contained ten pounds each of dynamite, with detonators of fulminating mercury, and electric fuses, and the firing was done by means of a powerful battery, the circuit being closed by a current from a smaller battery on shore. The closing of the circuit of the larger battery was done in a simple but effectual way. On a little stand in a cup of mercury, connected with one pole of the battery, was placed a glass tumbler, on the bottom of which lay the end of a wire connected with the other pole. In the same tumbler, standing on the bottom, was an iron rod, and on top of the rod was an ordinary fulminate exploder, in which were buried the two wires from the auxiliary battery. The tiny spark from the shore battery ignited the exploder, which blew the iron rod so violently downward as to knock out the bottom of the tumbler; the mercury then rose into the tumbler, completing the main circuit and firing the mine.

LA SEMAINE DES CONSTRUCTEURS revives the memory of an observation made by Viollet-le-Duc, that lead plates for roofing and other purposes are often pierced by insects. Viollet-le-Duc, if we recollect rightly, accused the wasps of being the authors of the little holes which he found gnawed in lead roofs, but later observers have discovered that both worms and flies often drill through heavy plates. Some twenty-five years ago it was found that the lead bullets of cartridges, which had been stored in wooden boxes, were badly gnawed, and a number of gall or saw flies were found in the act of working upon them. Why these little creatures should amuse themselves in digging out the tough metal with their jaws it is hard to say. Both males and females were found at work, and the only suggestion which *La Semaine des Constructeurs* can make is that they were, perhaps, sharpening their teeth. The first notice of perforations made by worms seems to have been made by M. Janniard, formerly official architect in charge of churches and public buildings, who observed that the lead-covering of the steps on the roof of an old house in Paris were bored through in several places. Only one of the steps was attacked, and, on looking closely, he found that every hole in the lead corresponded to a worm-hole in the oak planking on which it was laid.

WE do not often stray so far out of our way as to include any items of natural history in these columns, but the *Scientific American* tells a story about a certain California bird which is so astonishing that we cannot refrain from quoting it. According to this the California road-runner, or chaparral cock, or paisano, is a little greenish bird, inhabiting the hot and sandy regions of Southern California, Mexico, Arizona and Texas, which leads a life that would be quiet and uninteresting except for the invincible hatred which it cherishes for rattlesnakes. It need not be said that rattlesnakes abound throughout this region, and the road-runner has an opportunity occasionally of finding one asleep in the sun. Whenever this happens, it starts immediately for a prickly-pear bush, which it is sure, in that hot country, of finding not far off, and pulls off with its bill a leaf, which it brings and lays near the sleeping snake. A second leaf is then brought and laid near the other, and then a third, until the industrious bird has made a ring of the leaves around the snake. When all is ready, it wakes the snake by a sharp nip with its bill, and then retires to watch the result. The leaves of the prickly-pear are covered with long thorns, as sharp as needles, and the snake, starting from his sleep, soon comes in contact with some of them. Not being a creature of very brilliant intellect, he first coils for an attack upon his assailants, and then, finding that this only brings him in contact with more thorns, tries to crawl over the circle and get away. This attempt buries scores of thorns in his body, and he loses his temper, and begins to lash with his tail, and bite at random among the leaves. It may be imagined that this does not help him much, and he finally becomes wild with vicious fury, and turns upon himself, burying his fangs in his own body, and soon dying of the poison. The little bird meanwhile stands near, contemplating the spectacle and occasionally flirting its tail in token of enjoyment; and unless disturbed it does not leave the scene until its enemy is dead.

MURAL PAINTING.[1] — III.

ENCAUSTIC AND TEMPERA OF THE ANCIENTS.



OF the various kinds of mural painting, several take their name from the vehicle with which the colors are mixed, as *tempera* or distemper, oil, and water-glass. *Fresco* — real fresco, not the sham palmed off as fresco — is so called because the colors are laid on *fresh* plaster. *Encaustic* implies the application of heat, either subsequent to the laying on of the colors or during the operation. There are other kinds of mural painting, but they can all be classified under these five historical heads, unless mosaic and stained glass be reckoned phases of mural painting. Though several of these methods have been employed by different peoples, and at times mutually remote, others are invariably associated with definite epochs and nations. Instances of the arch, by way of illustration, are frequent enough before the days of Rome, yet it is justly deemed a Roman method of construction, inasmuch as the Romans were the first thoroughly to develop its constructive possibilities. Thus encaustic is peculiarly a Grecian method of pictorial expression. Fresco, though practised alike by ancients and moderns, is *par excellence* the medium of the Italian Renaissance decorators. Water-glass is a modern German method.

Though several mummy-masks have been found that prove the knowledge of encaustic painting by the Egyptians, yet this process was not developed by them till after the Macedonian conquest. Distemper was the national method. The menstruum employed was probably some flexible gum, such as tragacanth, mixed with water. Perhaps honey was at times the vehicle, as it is now for water-colors. It should be noted that their paintings have rarely cracked. The colors were applied with brushes; the smaller made from reeds soaked in water till their fibres were separated; the larger from branches of the *salvadora persica*. The Egyptians tapestried their buildings with color, externally and internally, without regard to architectural lines, but rather to "immortalize the ideas that floated through" their "brains." The light in Egypt is intense, and there was need to emphasize the structures with color. The vibration of strong color under strong light is so great that its strength is broken, and pure tones are tolerable, where, in grayer climes, they would be insupportable. The pigments were brushed on a coat of white stucco, which enhances their brilliancy. On both outside and inside walls the decorations were first engraved or sculptured, before receiving this priming coat — which obliterated the joints of the masonry — probably to give durability. In the tombs, however, where there was no wear and tear (how little did they foresee, poor souls), the painter worked without the concurrence of the sculptor. Yet the paintings on the sculptured grounds must have been very perishable. A sharp abrasion would detach the stucco, or a severe earthquake shock open the joints of masonry. Not being works of art, however, in one sense of the word, they could be easily repainted. Figures played a more prominent part in Egyptian mural decoration than in that of subsequent epochs. But they were decorative or hieroglyphic forms, rather than figures, as the Greeks understood them. Figures were used by the latter less abundantly, less monotonously, with more discretion and telling concentration, not to speak of artistic merit. The use of figures on ceilings was avoided by the Egyptian painters, their treatment of the human form not favoring its adoption. (In later days the problem was — and still is — terrible to solve.) "The ceilings of the temples at Thebes had generally a blue ground, upon which vultures, with their great wings outspread, floated among golden stars." All this and very much more may be found in the "*History of Ancient Egyptian Art*," by Perrot and Chipiez, a very readable book, unencumbered by an excess of archæological baggage, so discouraging to the busy practitioner.

The Greeks painted in fresco, tempera and encaustic. With them the encaustic process reached its highest development. They used it not only in flat tints to cover plain surface or sculptured ornament, but also to model the delicate undulations of the human form. Great ingenuity and learning have been displayed in the many attempts to solve the encaustic riddle. Unfortunately, the texts on which scholars rely to elucidate the process were not always written by professional men. Unfortunately, too, the scholars have, in many instances, been unfamiliar with the technics of painting, and have, moreover, encumbered their theories with a prodigious number of citations more flattering to their erudition than edifying to the inquirer. The most intelligible and rational account that I have yet seen is a monograph, published last year in Paris, entitled "*L'Encaustique et les Autres Procédés de Peinture chez les Anciens, Histoire et Technique, par Henry Cros, Statuaire et Peintre; Charles Henry, Bibliothécaire à la Sorbonne.*" After a critical examination of existing texts and monuments, they thus restore the encaustic process: (Be it understood that encaustic means a *burning in*, and that no system of wax-painting can properly be called encaustic, unless there is an application of heat.)[2]



The Muse of Cortona.

"When the colored sticks of wax and resin have been melted over the fire, either in separate cups, or, better still, on a metallic palette with depressions for the colors, the tones are laid on the panel with a brush. Up to this point the work is rough and disunited. Now the tones are blended with the cestrum — at times red-hot. From the cooled palette, or from another set for the purpose, with (cold) wax colors, the intermediate tones can be taken with the cestrum, still hot, to give the gradations to the modelling."

From this primary process they derive three secondary: —

(1) "Hot-painting with colored sticks of wax and resin, softened by the addition of an oil, conveyed to the panel from a hot palette with the brush, then melted and modelled with the cestrum. The addition of oil, while facilitating the work, enables it to be finished more highly. We shall not be far out, if we see in this method the technic of the painting of Cortona.

(2) "Cold-painting with colored sticks of wax and resin, softened by the addition of an oil, applied directly to the panel like crayons of paste, then worked with the cestrum, just as modelling-wax is worked with the tool.

(3) "Cold-painting with colored sticks of wax and resin, dissolved in an essential and volatile oil, and applied with the brush."

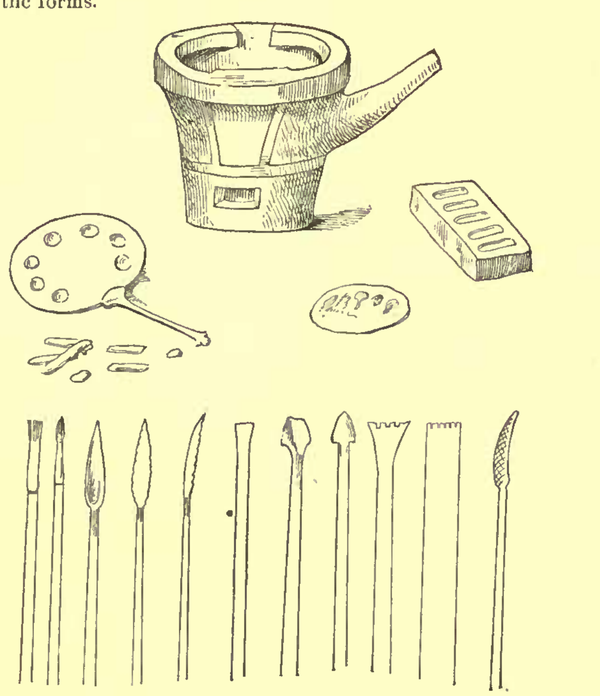
The *cestrum* (generic name *cauteria*) is a metallic instrument for modelling the wax, of which many examples are to be found in museums. The shapes are various, both to meet the needs of the process and the personality of the artist — as to-day some painters prefer round brushes to flat, and *vice versa*. They were heated, in order to blend the vigorous but rough strokes of the brush, and without which the soft transitions from tone to tone could not be effected.

[1] Continued from page 40, No. 525.

[2] The ancients sometimes used the term *encaustic* synonymously with *painting*, as some moderns apply the term *fresco* to all mural painting. For clearness's sake it would be better to restrict both words to their original and legitimate signification.

Reference is made above to the famous "Muse of Cortona." Some doubts have been cast on its antiquity; our authors, however, believe in it. It was found by a peasant in the environs of Cortona, along with several statuettes, in 1732. It is two-thirds the size of life, and is painted on slate. "The family venerated it for a long while as an image of the Virgin; but the good people, having discovered their mistake, used it to close a little window near an oven, and even cut off the two upper corners. It remained in that state till the year 1735, when the Cavaliere Tommaso Tommasi, proprietor of the estate, purchased and saved it from such barbarous treatment. Thirty years ago, Signora Louisa Bartolotti Tommasi presented it to the Etruscan Academy of Cortona." "The coloring is perfect; the drawing deliciously pure. The process is evidently encaustic — encaustic pushed to the last stage of perfection. . . . The modelling is very diversely treated. There are long marks, like crayon lines, on the drapery, the breast, the arms, the nose, brow, and ear; the neck and throat look as if they were ironed — not the sign of a harsh mark, but that of an instrument, long or flat, according to the exigencies of the case. Is not this a sufficiently clear indication of the cestrum?"[1]

Whatever doubts may be cast on the authenticity of the celebrated muse, there are three encaustic portraits from Egypt in the British Museum, and three more in the Louvre, that are incontestably ancient. The latter represent members of the family of Pollius Soter, archon of Thebes in Hadrian's reign (A. D. 117–138.) On one of these in particular — the head of a young girl, strangely fascinating — the technic of the cestrum is clearly visible. "Sometimes long marks, as though the color came from an inexhaustible brush; sometimes hollow hatchings, softly breaking over-defined touches, model the forms."



Modern Encaustic Tools.

MM. Cros & Henry devote a chapter to their "personal practice of encaustic." As practice is more convincing and intelligible than theory, I shall give a *résumé* of their experiments.

1. *The Heater.* — Its functions are to prepare the colored sticks of wax; to keep the palette hot for brush-work; and to heat the cestra. The heater should be of metal or earthen-ware, and rather small. Otherwise the painter would be incommoded by the burning charcoal. To avoid the blueish fumes of oxide of carbon, preference should be given to embers (perhaps kerosene could be utilized). Its orifice should be a little more than a hand's length in diameter, and the palette should rest horizontally on its edges.

2. *The Hot Palette* — Should be a disk of tinned metal — iron or copper — on which there should be circular depressions for the colors, the centre of the palette being left free for their mixture. It should have a handle covered with wood to protect the painter's hand from heat.

3. *The Wax and Colors.* — Apothecary's white wax is the best. It can be used alone for preparing the colors, but it is an advantage to add to it one-half its weight of purified fine resin, called colophony — the least colored to be preferred. This addition notably economizes the wax, and far from injuring the colors imparts to them greater brilliancy and tenacity. Certain colors require more wax than others; the quantity being determined by experiment. This is the way: place a tinned (or better enamelled) pot on a moderate fire; then put the color into it ground very fine. The color should now be stirred with half a cake of white wax. From time to time throw into this compound, liquified by the heat, as much resin as there is wax — or a trifle more if necessary. When the color is thoroughly mixed and has sufficient covering-power, it should be moulded into sticks, and subsequently placed in a color-box. The palette may be as extended in range of tone as desired.

4. *The Brushes.* — In order to paint, the colors should be melted in the depressions of the palette, and then rapidly applied with the brush. All sorts of brushes are allowable, from the broadest bristle to the most delicate red-sable. Care must be taken not to turn back the hairs of the brush in too hot colors, or to give them an ugly twist by pressing them too long against the over-heated palette.

5. *The Cestra.* — The brush-work, if well touched, gives a vigorous aspect to the sketch, which cannot be pushed further without the intervention of the cestra. These are necessary to unite the tones. As has already been observed, they are of various shapes suited to their special offices. They should be long enough to protect the artist's hand from the heat. An angle, at some part of their length enables the painter to see his work more easily.

6. *The Cold Palette* — Should be an oval or rectangular piece of thin wood, small enough to be held in the left hand. The colors are to be poured on it and allowed to cool, and then to be conveyed to the panel with the heated cestra. Encaustic is applicable to all sorts of surfaces — wood, linen primed with glue, stone, plaster, slate, and even paper. Freedom from humidity being assured, a priming of white wax is laid on with the brush, and afterwards burnt in with a brazier or hot iron, till the pores of the ground are well filled. Even this priming may be dispensed with, provided the subsequent painting be heavy enough thoroughly to cover the ground, so that it may be worked with the hot cestrum.

To recapitulate, we have a primary encaustic process — colors mixed with wax and resin, applied hot with a brush, and afterwards worked with a hot cestrum — and three derivative processes.

1. Similar to the primary process, but with the addition of an oil to facilitate the work. 2. Cold applications of the preceding mixture conveyed to the panel like crayons of pastel, and modelled with cold cestra. 3. Cold brush-painting with colors of wax and resin dissolved in an essential and volatile oil (such as spirits of turpentine). These last two processes are not, strictly speaking, encaustic. MM. Cros & Henry do not mention the final cauterization of the cold process. This would probably be optional, though it was undoubtedly applied at times, if we are to place any credence in the ancient texts — the famous "*ceris pingere ac picturam inurere*" among others. Not improbably, the picture was sometimes polished with fine linen — wax readily taking a polish.

Encaustic of Ships. — The colors were mixed with wax and pitch — the latter to increase the resisting power of the former — applied with the brush, and then passed over with large heated irons.

Encaustic of Walls. — These are first painted in distemper or fresco, and afterwards fixed with a cauterization of wax, as both Pliny and Vitruvius explicitly say. When the wall is thoroughly dry it must be covered with a coat of melted Punic wax mixed with oil, then sweated with a brazier, and finally rubbed with a candle and fine linen which gives a lustre to the surface. We know that the exteriors of the Greek buildings were highly colored, even when of marble. The statues were not only cauterized for their preservation, but sometimes colored and cauterized for their embellishment. Vitruvius tells us that the triglyphs of temples were colored blue. The fragment of a Greek inscription, found in 1836, refers to the workman who *burnt* the cymatium of the temple of Minerva Polias. It is more than probable that these flat tints on marble, exposed to atmospheric corrosion, were cauterized, just as the statues were. Does any one ever take the trouble now-a-days to cauterize a statue?



A Paintress at Work.

Great care was bestowed on the plastering. Vitruvius describes the process at length in his well-known Seventh Book. As the

[1] Cros & Henry, following Zannoni, do not accept the genuineness of the Cleopatra said to have been found at Hadrian's villa. They base their doubts especially on the too evident contradictions between it and the recognized portraits of Cleopatra, not to mention "all the impossibilities." If one may judge from the steel engraving of it, by Mr. John Sartain — which is, no doubt, a faithful translation — its antiquity may well be questioned. There is not a particle of antique feeling in it, the jewelry and forms of the ornaments, as well as the treatment of the drapery, being notably unclassic in taste. On the contrary, it has considerable affinity with the feeling of the late Renaissance work.

very life of mural painting depends on the preparation of the wall, it may be well to quote one or two garbled passages from Gwilt's translation. Wattling with reeds seems to have been an effective precaution against cracks. "When arched ceilings are introduced they must be executed as follows: Parallel ribs are set up, not more than two feet apart. These ribs are fixed to the ties of the flooring or roof with iron nails. The ribs having been fixed, Greek reeds, previously bruised, are tied to them with cords made of the Spanish broom. On the upper side of the arch a composition of lime and sand is to be laid, so that if any water fall from the floor above, or from the roof, it may not penetrate." [Well-thought of safe-guard.] "The arches being prepared and interwoven with the reeds, a coat is to be laid on the underside. The sand is afterwards introduced on it, and it is then polished with chalk or marble. . . . If stucco be used on timber partitions, which are necessarily constructed with spaces between the upright and cross pieces, and thence, when smeared with clay, liable to swell with the damp, and when dry to shrink and cause cracks, the following expedient should be used. After the partition has been covered with the clay, reeds, by the side of each other are to be nailed thereon with bossed nails; and clay having been laid over these, and another layer of reeds nailed on the former, but crossed in their direction, so that one set is nailed upright and the other horizontally; then, as above described, the sand and marble coats and finishing are to be followed up. The double row of reeds thus crossed on walls prevents all cracks and fissures." As to the plastering "three sand coats" — besides the rough-cast — are recommended, "and the same number of marble-dust coats," the walls will then be solid and not liable to crack. This, of course, is the ideal wall. "When only one coat of sand and one of marble-dust are used, it is easily broken." But mortals were human in those days, too, for Pompeii testifies to instances of only two coats. The Greek plaster was so hard that slabs of it were cut from the ancient walls and used for tables. The ancients painted in fresco and distemper as well as in encaustic. Their frescoes will be discussed later. There is little to be said about their distemper work — which was similar to any tempera painting. The colors were tempered with a gum, or glue, or honey, egg, juice of the fig-tree, milk, or other glutinous substance, soluble in water, that serves to bind them.

I shall close this paper with an illustration from Pompeii, representing a paintress copying a Hermes of Bacchus. In her left hand she holds an oval palette, in the right the cestrum or brush (the painting is somewhat vague), which she dips into the box, the colors on the palette being exhausted. If the cylinder contains fire, then we have a representation of the encaustic process; if its purpose is merely to raise the box, we have an illustration of the cold process.[1]

FREDERIC CROWNINSHIELD.

[To be continued.]

COMPLETION OF A FRENCH UNDERGROUND TELEGRAPH LINE. — The underground telegraph line connecting Paris and Marseilles is now completed. Instruments are being put into offices at the cities named and in Lyons, and the line is to be at once thrown open to the public. This line renders the company independent of the weather, and, it is believed, will demonstrate the feasibility of underground lines. So confident are the projectors that a movement is now on foot to extend the line to Toulon and Nice. The overhead lines are to be retained and used as auxiliary. — *Exchange.*

[1] We regret that it has not been possible to reproduce the photograph of the Muse of Cortona in such a way as to illustrate the only feature which Mr. Crowninshield particularly desired to have made clear, that is the evidence of the manipulation of the cestra on the wax-coated surface. Nevertheless, as the cut gives a suggestion of the very charming countenance of the Muse, it seems worth while to use it for its decorative value alone.— EDS.

THE ARCHITECTURAL DRAWINGS AT THE EXHIBITION OF THE SALMAGUNDI CLUB. — I.

MOST of the younger architects of the country, and many of the older ones, have probably been looking forward with interest to the exhibition of the sort of drawings that they appreciate best, which has been undertaken this year in New York in connection with the annual exhibition of the Salmagundi Club and the American Black-and-White Society. Thanks to the energy of the managers, who have been well seconded by their correspondents in the large cities, a much larger and more representative collection of such works has been got together than was ever shown in this country before, while the drawings shown surpass those gathered together in such previous exhibitions as we have happened to see, as much in quality as they do in number. How rigorous may have been the judgment of the managers upon the drawings offered we cannot say, but they have, as a result, filled to overflowing the space allotted them with sketches, finished and half-finished, which do honor to the artistic capacity of American architects.



Rendez-vous de Chasse of Francis I, at Moret, France.

[From the *Moniteur des Architectes.*]

Entering through the rather complicated series of rooms which compose the galleries of the American Art Association, we come upon two staircases, both leading to the same place, and a sign informs us that at their common top we shall find the exhibition of architectural drawings. Both stairways are lined with enticing objects, and, after hesitating awhile, like the celebrated donkey, unable to decide which to ascend, we solve the problem by going up the left-hand one, impressing upon our minds a strict direction to be sure and remember to come down by the other. Before ascending, we stop to examine a cluster of frames, filled with sketches of all sorts, in color and line, showing exteriors and interiors, decoration, furniture and complete buildings, and bearing the name of H. T. Schladermundt, Cincinnati. Most of them are roughly done, but all are effective and interesting, the more so from the versatility shown in them. The first impression given by the set of drawings is that Mr. Schladermundt must be a professional decorator, so rich in color are many of them, and the impression is confirmed by finding here and there traces of the faults common to decorators, of neglect to preserve a similarity of scale among their patterns, and of carelessness in regard to the drawing of details; but on turning to the other side of the stairway we find some pretty sketches in line, by the same hand which are as full of architectural feeling as anything in the rooms; and one of them, a study for a town-hall, is a model of that easy and clever mixture of reminiscences of all sorts of styles which our young architects love so much and manage so well. Close by Mr. Schladermundt's drawings are hung three beautiful colored drawings signed by Mr. S. How, two of them showing studies for interior decoration, and the third a design for the inlaid top of a grand piano. Leaving these, reluctantly, we climb the stairs to the entrance-door of the large gallery, which stands invitingly open, and, before entering, we bethink ourselves to open our catalogue, that we may know as soon as we reach it, and with precision, the name of the author of each of the works which tempt us from all parts of the room.

Little more than a glance at the document is necessary to show us that our anticipations of being able to use it in this way must be curbed. By careful comparison of the various methods of spelling and expressing the same name which are used in different parts of the catalogue, combined with strenuous efforts to recall from memory the actual names of persons to whose identity the appellation given

in the catalogue gives but the feeblest clue, it is possible to attribute most of the drawings with tolerable certainty to their real authors; but this, as we find, takes an amount of time and patience, which we unwillingly spare from the contemplation of the work before us. It is our firm belief that every one who has worked out a problem, or deciphered a riddle for himself, owes it to those who may come after him to give them the benefit of his labors; and we will therefore explain, for such of our readers as may go to see the exhibition hereafter, that we have discovered that, among other things, the C. Gilbert, New York, and Cass Gilbert, St. Paul, whose names appear in several places in the catalogue, are one and the same person; that Charles Blackall and C. H. Blackall, of Boston, mean one individual, and that his name is not Charles but Clarence; that Mr. Ticken and Mr. Ficken of New York are the same; and that "Edmond Street, R. A." is no less a personage than the late George Edmund Street, perhaps the greatest architect that country has produced.

After getting these matters properly disentangled in our mind, we enter the gallery and find the place of honor, on a stand in the middle of the room, occupied by Mr. Richardson's noble competition drawings for the Albany Cathedral. Familiar as they are, we can never see them without wishing to study them more, and we now devote a little time to admiration of the pure and simple dignity, the breadth and solidity, together with the studied delicacy of this great design. Closely by the Cathedral drawings stands a plaster model of a charming seashore-house, by Mr. Edwards-Ficken, of New York. In its way it possesses the same elements which give greatness to Mr. Richardson's design, as well as to all other works of true architectural art. Although broken up with piazzas, bays, and balconies, the form of the building is kept from disorganization by the long, straight ridge of the roof, which runs intact from end to end of the house, and binds all the other features into a single composition, the remaining parts of which may be, and are, treated with a picturesque freedom that would end in riot if the unity of outline were not so firmly preserved by the long roof. Beneath the eaves, little oriels and short and shady galleries give an immense piquancy to the upper story, while the wide arches of the porches below introduce there an element of firmness and largeness which is well seconded by the terrace that melts in effective lines the rectangular modelling of the house into the soft curves of the ground.

Beginning at the point nearest to these detached objects, we find Number 19 the first number among the drawings hung upon the wall, with the exception of one of a large set of drawings of architectural subjects lent by the Century Company, of which we will speak more at length hereafter. Number 19 is a small water-color study of a city parlor, by Mr. E. A. Sargent of New York, in the pleasant and highly-finished style which Mr. Sargent's friends know so well, and which makes it contrast all the more painfully with a huge, raw, black and coarse pen-and-ink, or rather ruling-pen-and-ink, drawing of the interior of a hall, by Mr. Linfoot, of Philadelphia. Mr. Linfoot has a very considerable reputation as a pen-and-ink draughtsman, and it is only proper to say that we presume that this, and one other sprawly black drawing of the same character, were made for photographic reproduction at a much smaller scale, and that the ink lines were purposely and necessarily made coarse and straggling; but the contrast of this particular work with Mr. Sargent's miniature water-color on one side, and on the other side Mr. Haight's pale and delicate, but excellent pen-and-ink sketch of one of the Columbia College buildings (No. 22), is little short of ludicrous. Passing by four or five rather uninteresting works in black-and-white, as well as color, we are attracted to a clever sketch in Rouen (No. 26), by Mr. E. C. Cabot, of Boston, whose skill as a water-colorist is well-known; and close to this we find a handsome colored perspective of some houses in Chicago, drawn for Messrs. Burnham & Root by Mr. Paul C. Lautrup. Messrs. Burnham & Root have done much to promote the success of the exhibition, by their efforts among their friends in Chicago as well as by the contribution of a considerable number of beautifully rendered perspectives of their best buildings; and while we are sorry to find no example of Mr. Root's own color-sketching, it is gratifying to observe the honorable way in which they have encouraged the signing of drawings made from their designs by the artist who rendered them.

Two or three other pretty and interesting sketches from the West follow Messrs. Burnham & Root's drawing. The best of these is, in our judgment, No. 31, a beautiful little design for a country house, beautifully shown in pen-and-ink, by Messrs. Hodgson & Stem, of St. Paul. No. 37 is also by Messrs. Hodgson & Stem, and represents, in warm sepia or brown ink, a block of city houses, of rather extravagant though picturesque design. Between these is Mr. Cass Gilbert's pen-sketch of a house near St. Paul, which had the good fortune to be selected for reproduction as an etching in the *Moniteur des Architectes*, not long ago, as a typical example of American architecture. Nos. 40 and 41 are well-executed pen-drawings, the former by Mr. R. W. Gibson, of Albany, of his design for the cathedral of that city; and the other by Mr. Bruce Price, of a particularly quiet and satisfactory house at Wilkes Barre, Pa. No. 43 is an elaborately-finished color-drawing of Mr. Haight's Cancer Hospital in New York, one of the best-designed among the new buildings in the metropolis. Interspersed among these are several colored sketches from nature, of curiously different character. No. 39, by Mr. A. D. F. Hamlin, of New York, is a stiff, but conscientious, study of an interior in the Louvre; and No. 45, by Mr. J. P. Putnam, of Boston, which is nearly as stiff, but less pleasantly colored, represents the interior of Milan Cathedral. Close by these, as if for contrast, is a sketch, in color, of a church in Bologna, which, with No. 57, a church in Milan, are almost models of what an architect's sketch should be. Broad washes, clear-cut shadows, first bring out and fix irrevocably the forms with which the sketch deals, and selected details of form or color are then elaborated with such attention as the interest of the subject, or the time at command, may permit. Mr. Walker is a born colorist, and the single-graded washes, with which he indicates the side of a tower or the shadow of a wall, are of nearly that precise tint and force which could not be modified, one way or the other, without injuring the effect. We say nearly, because, if the sketches have any fault, it is that the general tone is too pale; and once in a while, when a detail is taken up for final study, the fascinations of full color run away with the artist, and his mosaic or tiling, beautiful by itself, becomes a spot on the rest of the work.

The next drawing that particularly attracts us after these, are two tiny brown-ink sketches for country houses, Nos. 60 and 63, by Messrs. Andrews & Jaques, of Boston. No. 60 is, perhaps, the best, but both are, in every way, charming. Between them is another of the same sort, by Mr. A. G. Everett (No. 61), also of Boston, which is only a little less pretty and taking than that of his compatriots. Rossiter & Wright, of New York, come next, with a sketch for a chapel (No. 64), apparently in Payne's gray, and cold, but well designed and effectively rendered. Their great success, however, is to be found in No. 92, a small drawing of a house in Connecticut, made in pencil on rough paper of a dingy brown, and colored in mere washes over the pencil. The lights are made with color, mixed with Chinese white, and the effect, in their hands, is admirable. The design of the house, which is one of the best things in the room, has much to do with the result, but the rendering is so extremely clever as to make the drawing conspicuous in the midst of far larger and more ambitious works.

We pass rapidly by the next half-dozen frames, turning only to notice some more slight, but pretty, pen-sketches by Messrs. Andrews & Jaques, and an elaborately-colored drawing of a room in the Ducal Palace, at Venice, by Mr. W. P. P. Longfellow, of Boston, and stop before a mass of red color (No. 78), which represents the new railway station in process of erection on 138th Street, New York, from the designs of Messrs. Robertson and Manning. Now, as this, though by no means the only red design in the room, is perhaps the most vivid in color, we feel ourselves impelled here to unburden our minds a little on the subject of the use, and abuse, of the red tints which are now so lavishly used in architecture. If any one will look long at this drawing, and then at Nos. 89, 152, and a few others, and afterwards at Nos. 90, or 92, or 100, we believe that, however prejudiced in favor of the fashionable color, he will acknowledge that he still needs to be educated up to enjoying it. He will probably, however, if he is a disciple of the advanced school, murmur apologetically something about red being "warm," or "rich," or "artistic," or "like old work;" and to this we should reply that, although we cheerfully yield the point about its being "warm," an almost unbroken red, from water-table to ridge, such as some architects persist in using, is neither rich, nor artistic, nor like any old work now existing in any civilized country.

The true use of red, as a ground color, is for bringing into harmony a number of other colors placed upon it, or close beside it, which would be discordant and disagreeable unless subdued into place by the superior power of the red. It often happens in buildings, particularly if any polychromatic effect is attempted, that a score of details, of different sizes, shapes and colors, jostle each other all over the elevations, and experience has shown architects of feeling that the easiest way to bring order into the jumble is to set it against a background just red enough to subordinate all the other colors to itself. The effect, however, of spreading red over the walls, roof and woodwork of a comparatively simple structure, as we sometimes see it, is simply to drown all the details and surroundings in a chromatic shriek, which produces about the same effect on the mind as would the introduction of a locomotive whistle in an orchestra. In the old work, which is used to excuse so many eccentricities, there is little, in the reddest buildings, of that glare so common now. A red tile of the ruder sort is rather brown than red, and has, moreover, when held at an angle with the light, a bluish bloom, which, when laid on a roof, takes away almost the last trace of the red character, leaving the tile a mixture of blue melting into brown, with red streaks only on the edges, and playing faintly through the other colors. So with the ancient brickwork, which, when not plastered over, is rather brown or purple than red in general tone, showing the more brilliant color only in spots and lines.

(To be continued.)

DUTY ON STATUETTES.—The Treasury Department has affirmed the action of the Collecter of Customs at Philadelphia assessing duty at the rate of sixty per cent *ad valorem* on certain terra-cotta statuettes, about ten inches in height, painted and decorated, which were returned by the appraiser as decorated earthenware. The Department holds that terra-cotta ware is embraced under the general term earthenware, as used in the statute. It was claimed by the appellants that the articles should have been classified as statuary, dutiable at the rate of thirty per cent *ad valorem.*

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Picturesque Bits at "Cushings."



THE THAXTER COTTAGE:



"Dakers"



THE FARM BUILDINGS:



THE FARM HOUSE:

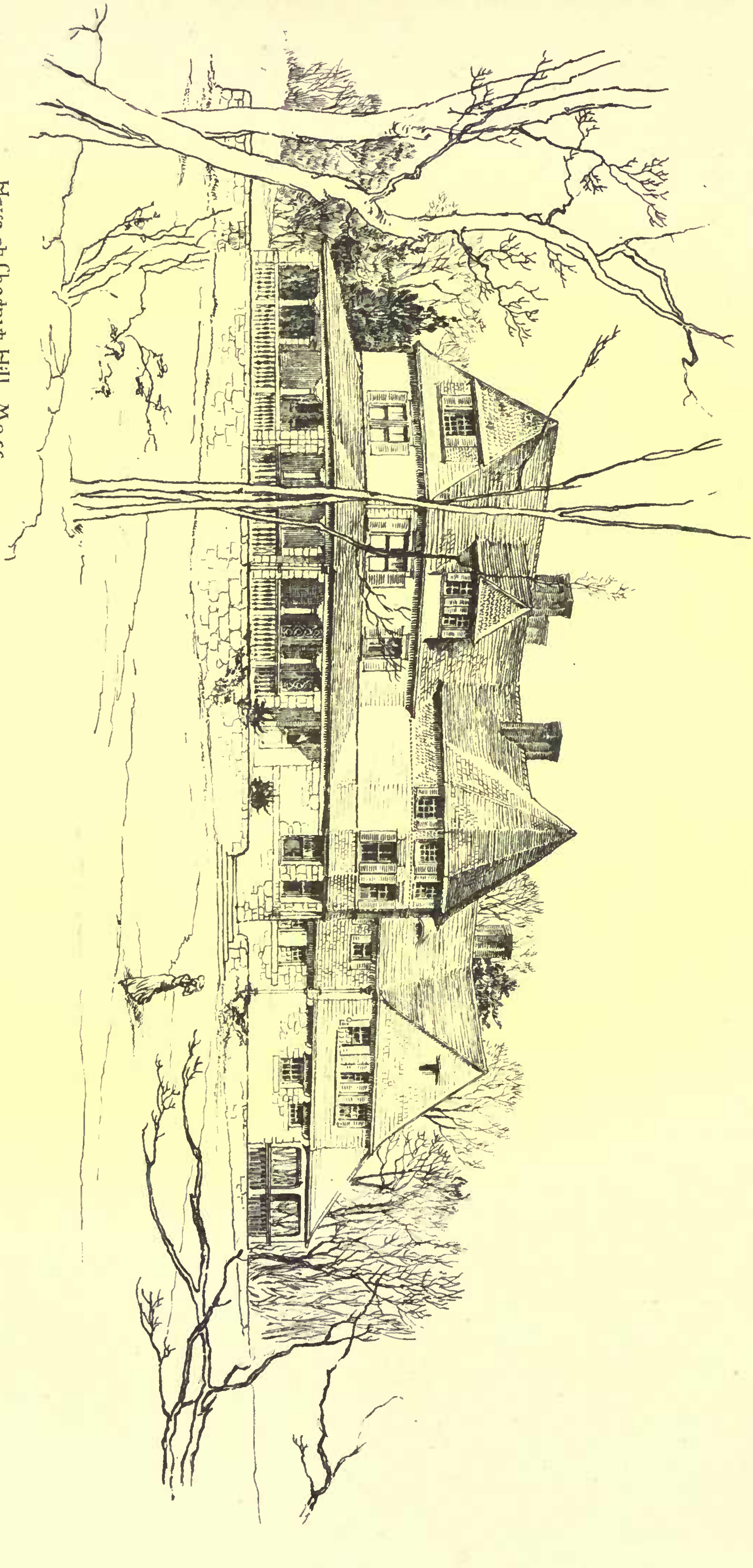


AT THE OTTAWA.

JOHN CALVIN STEVENS: ARCHITECT:: PORTLAND. ME. 1ST NAT. BANK B'LD'G.

HELIOTYPE PRINTING CO BOSTON

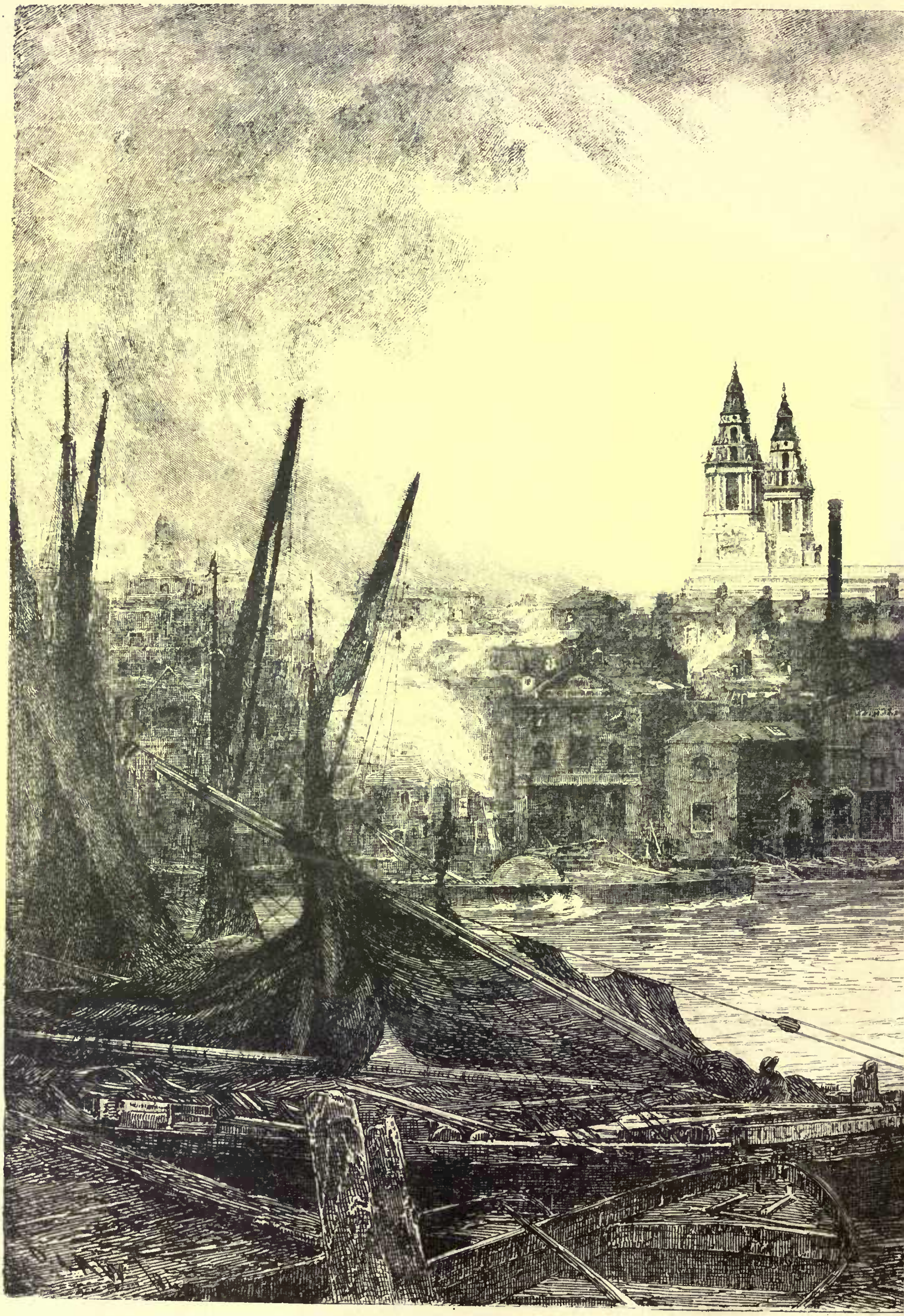
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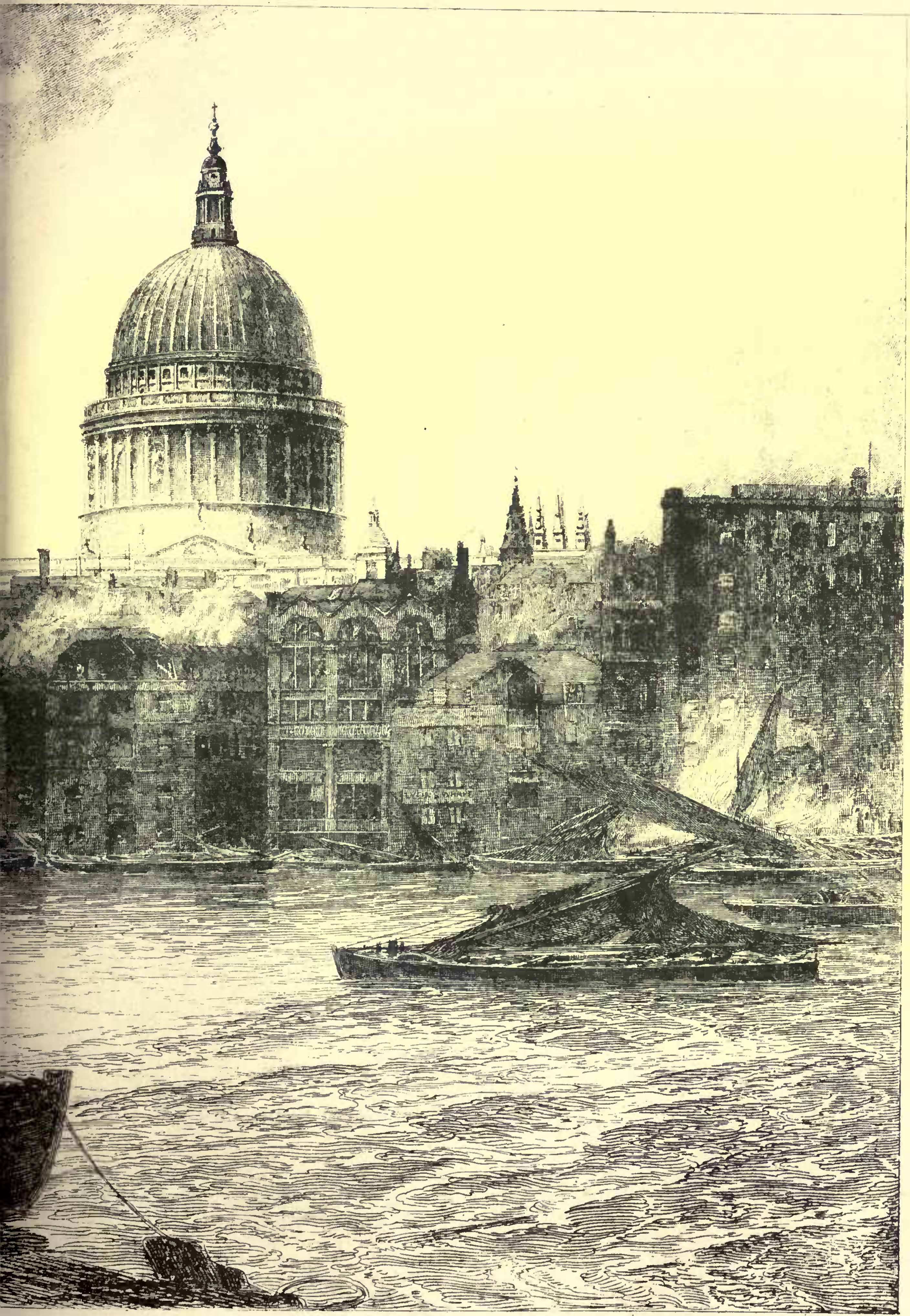


House at Chestnut Hill, Mass.
C. Howard Walker, Architect.

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St. Paul's Cathedral from Bankside.

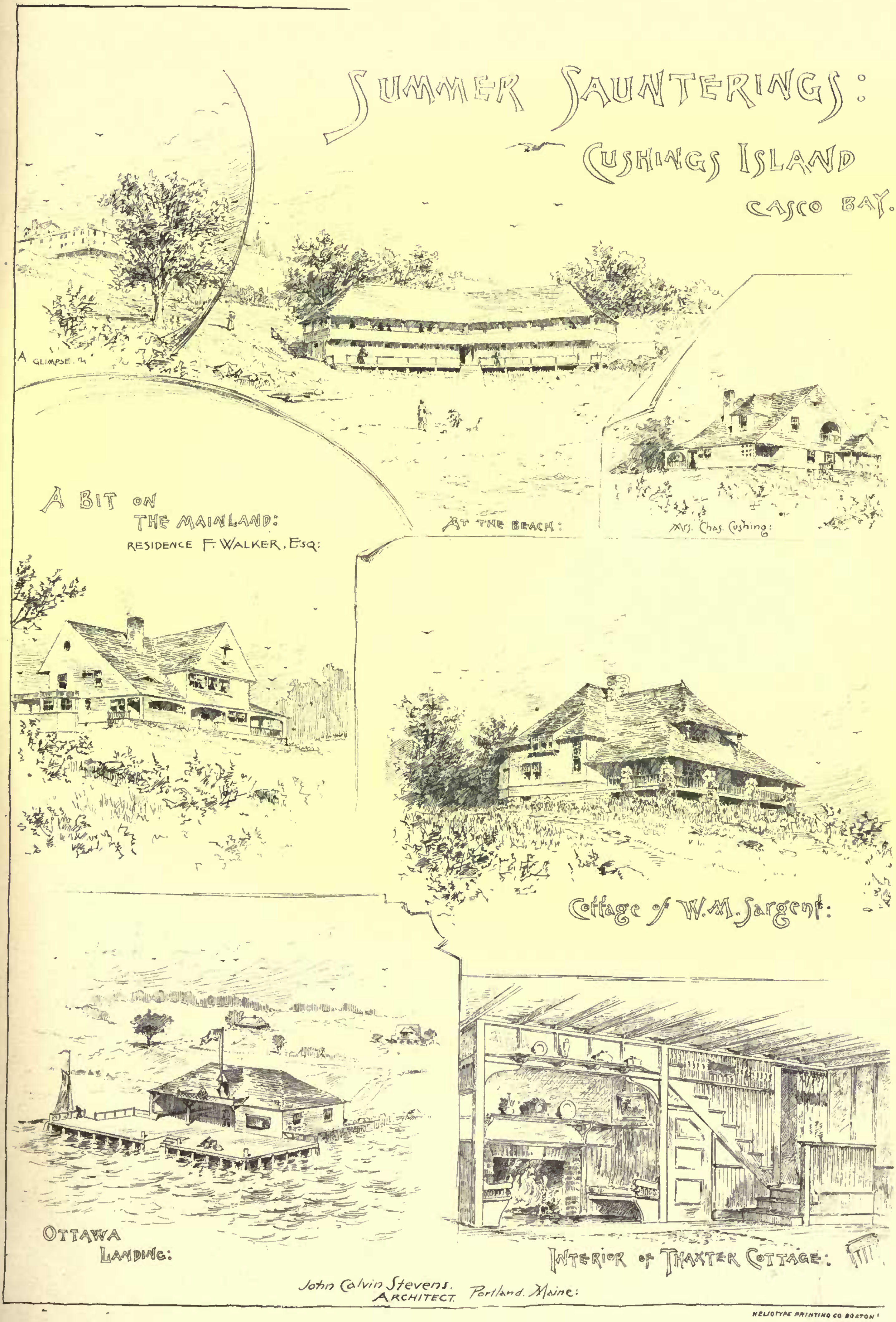
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APARTMENT BUILDING FOR L. P. HANSEN ESQ.
JOHN ADDISON ARCHT.
CHICAGO.

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Photo-Gravure Co., New York.

AMERICAN SAFE-DEPOSIT CO.'S BUILDING, 42d St. and 5th Ave., New York.

McKIM, MEAD & WHITE, Architects.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

BUILDING OF THE AMERICAN SAFE DEPOSIT COMPANY, NEW YORK, N. Y. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

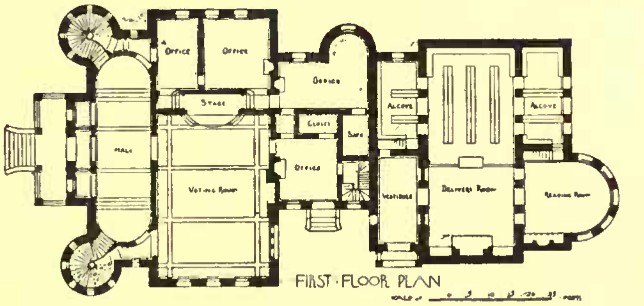
[Gelatine Plate, issued only with the Gelatine Edition.]

THE materials of the building are Scotch sandstone from the Gatelawbridge quarries, pressed-brick and terra-cotta. The walls of the Company's offices and of the bank's, on the first floor are lined with glazed brick, and the door and window architraves are of Knoxville marble. The Safe Deposit offices are on the ground floor; the extensive safety-vaults are in the basement under the building proper, while the parlors, coupon-rooms, etc., are outside the walls and under the area and sidewalk. These are all lined with glazed brick, and, with an abundance of light from above and a successful system of ventilation, have proved very attractive. The basement is reached by a marble staircase, with ornamental brass rails and balusters. The main floor is occupied by the Columbia Bank, and the upper floors by offices and bachelors' apartments. The building is at the corner of Fifth Avenue and Forty-second St.

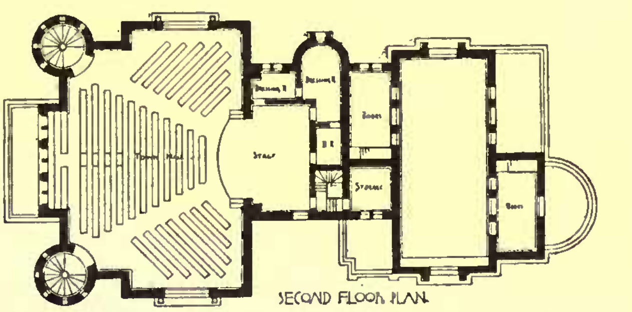
TOWN-HALL AND LIBRARY, WELLESLEY, MASS. MESSRS. SHAW & HUNNEWELL, ARCHITECTS, BOSTON, MASS.

[Gelatine Print, issued only with the Gelatine Edition.]

THE library at the southeast end of the building was completed in 1882; the town-hall in 1885. The walls are pasture stone from the immediate vicinity and Springfield stone, with a brick lining which



forms the inside finish. All the interior partitions are brick. The walls of the smaller rooms are decorated in oil-colors; in the larger rooms the brickwork is stained and waxed. The staircases are iron.



The main hall has a seating capacity of about six hundred, and the stage is fitted for theatrical entertainments. The building is heated by three hot-air furnaces.

ST. PAUL'S CATHEDRAL, AFTER AN ETCHING BY DAVID LAW.

THE stately dome of St. Paul's, rising gray and majestic above the dark warehouses across the long river, furnished an admirable subject for Mr. Law's needle, and he has well expressed its beauty.

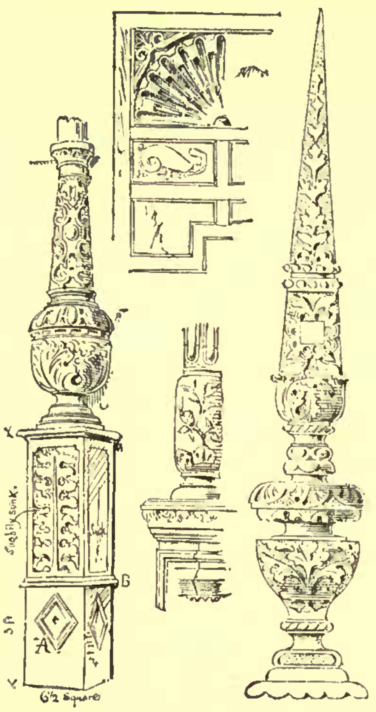
Born at Edinburgh in 1831, he was apprenticed, while very young, to a landscape engraver, and also studied at the School of Art of the Royal Scottish Academy in that city. On completing his apprenticeship, he procured an appointment in the Ordnance Survey Office, at Southampton, as an engraver of maps. For over twenty years, he labored at this work, but at last took to painting in his leisure hours, studying carefully from nature. His pictures, in both oil and water-color, met with such success that, about a dozen years ago, he gave up his official employment and removed to London, since which time he has been a constant contributor to the exhibitions. The heavy fogs which prevailed in London during the season of 1879, rendering painting almost impossible, led Mr. Law to try etching, which he did most successfully. He has produced a number of plates, covering a wide range of subjects, stretching from Venice to Westminster, from Seville to Whitby, and from Wales to Scotland. Among them are some ten etchings of the Thames scenery, from Windsor to Oxford. He is now engaged on a series of plates illustrating the scenery of the Trosachs. Mr. Law has also executed etchings of "The Spanish Armada sailing from Ferrol," after Oswald W. Brierly; "The Windmill," after John Linnell; "In the Valley of Desolation — Yorkshire," after Cecil Lawson; and "The Watering-Place," after Gainsborough. Mr. Law says of his etching: "My technical practice is of the old-fashioned kind — the ordinary smoked ground and the stopping-out process. I keep to this, simply because I know it." He is a member of the Society of Painter Etchers and of the Society of Scottish Etchers.

APARTMENT BUILDING FOR L. P. HANSEN, ESQ., CHICAGO, ILL. MR. JOHN ADDISON, ARCHITECT, CHICAGO, ILL.

HOUSES AT CHESTNUT HILL, MASS. MR. C. HOWARD WALKER, ARCHITECT, BOSTON, MASS.

PICTURESQUE BITS AT CUSHING'S ISLAND, CASCO BAY, ME. MR. J. C. STEVENS, ARCHITECT, PORTLAND, ME.

CONSTRUCTIONS IN EARTHQUAKE COUNTRIES.



Jacobean detail from late B. J. Talbert's Sketch book. Eng.

AT the seventh ordinary meeting of the institution of Civil Engineers, the 22d of December, a paper was read "On Construction in Earthquake Countries," by Mr. John Milne, F.G.S., Professor of Mining and Geology, at the Imperial College of Engineering, Tokio, Japan.

The result of observations showed that there was at least one earthquake per day in Japan, including simple tremors. Buildings in that empire were of three types: Ordinary brick-and-mortar structures, light wooden houses, and buildings strongly bound together with cement and iron rods, considered to be earthquake-proof. The author had observed the effects of earthquakes upon buildings, and had instituted experiments to measure the relative motion in different parts of a building when shaken by an earthquake, as well as others to determine how for earthquake motion might be cut off from buildings. Earthquakes which had produced effect on buildings in Japan, generally commenced with tremors of small amplitude and short period. They appeared to be surface waves, and lasted ten or twelve seconds. These tremors were succeeded by the shock. If this had an amplitude of twenty-five millimetres, and a maximum acceleration of five hundred or six hundred millimetres per second, brick chimneys were in danger of being cracked. The amplitude and period of a shock were measured by diagrams taken by seismographs. From these quantities, on the assumption of simple harmonic motion, the maximum velocity, which determined the projecting power, and the maximum acceleration or intensity, might be calculated. The author then showed in what respects the method pursued by him differed from those followed by the late Mr. Robert Mallet. M. Inst. C. E. The phenomenon terminated by a series of irregular vibrations, resultant on the first shock, together with other shocks at intervals of a few seconds. The period of all the vibrations depended partly on the intensity of the disturbance, and partly on the nature of the ground. These concluding vibrations had periods of from 0.2 to 0.25 of a second. The author showed that there might be a disturbance of very large amplitude which would produce no destruction, and that at two neighboring stations it was only the shocks which had similar directions. The motions were generally performed in ellipses, like the figure 8, spirals, and in a complexity of directions too intricate to define. The vertical component was relatively so small that it might usually be neglected. In the vicinity of an epicentrum, there was, without doubt, much vertical motion. Of this, however, the author had no experience; but he concluded that the area of the anaseismic wave was relatively small, and that if the effects of the horizontal shock could be nullified, much destruction might be prevented.

Experiments had shown that earthquake motion might be partially avoided, either by making a seismic survey of the area on which it was intended to build, and then selecting a site where the motion was comparatively small; or by adopting free foundations, or by using deep foundations. The author described a series of earthquake-stations he had established on the premises of the Imperial College of Engineering, Tokio, which included an area of ten acres. The differences in the amount of motion at some of these stations

showed that, in the same earthquake, buildings in certain positions would have been destroyed, while others on the same limited area would have been practically uninjured. The authorities in Tokio had since discussed the feasibility of making a seismic survey of the whole city, or at least of those portions where it was intended to erect large and important buildings. Some years ago the author made experiments to determine the difference in the range of motion on high ground as compared with that experienced on low ground. The result obtained in Tokio showed that there was least motion on the hills. This rule appeared to be reversed in Yokohama.

With respect to free foundations, the author had erected a building, twenty feet by fourteen feet, constructed of timber with a shingle roof, plaster walls, and a ceiling of laths and paper. The building rested on ten-inch shells, supported on cast-iron plates, with saucer-like edges fixed on the heads of piles. Above the shells, and attached to the building, were cast-iron plates ,slightly concave, but otherwise similar to those below. From the records of instruments placed in the building, it would appear that at the time of the earthquake there was a slow motion backwards and forwards, but that all the sudden motion or shock had been destroyed. Although this device somewhat mitigated the effects of earthquakes, the motion produced by walking, by the wind, and by other causes, resulted in effects much more serious than those due to ordinary earthquakes. To increase the rolling friction the author next employed eight-inch shot, and after that one-inch shot. The last attempt was to support the building at each of its six piers upon a handful of one-fourth inch cast-iron shot resting on flat plates. By this means friction had been so much increased that the house stood solidly, and unless its free foundations were pointed out, the peculiarities of building would not be noticed. Its movement at the time of an earthquake was very small. If still finer shot and in greater quantity could be employed, the resultant advantages might be increased. These experiments showed that light, one-story buildings, like bungalows, built of wood or iron, might be put up so that sudden horizontal motion of the ground could not be transmitted to them.

Experiments with regard to deep foundations had been carried out in a pit of ten feet deep and four feet wide. At the bottom, where there was a natural hard earth, a seismograph proved that there the motion was always very small.

The question of how to avoid destruction, due to the acquisition of momentum, was then discussed. It was pointed out that stresses and strains applied horizontally had chiefly to be dealt with, and not those due to gravity. This was illustrated by the ordinary masonry arch. For vertically applied forces this was stable, whilst for horizontally applied forces its stability solely depended upon the adhesion of the material which cemented it together. An examination of many brick arches which had been cracked by earthquakes showed among other points, that if archways were indispensable, they should curve into their abutments and not meet them at an angle. Another important rule was to avoid coupling together two portions of a structure which from their positions were likely to have different vibrational periods. A remarkable example had been afforded in Yokohama after the earthquake of the 20th of February, 1880. A moderately high factory chimney was supposed to require support; it was therefore connected by an iron band to a neighboring building. When the earthquake occurred the band cut it in two. Chimneys of bungalows were liable to destruction due to difference in vibrational period. By themselves, either the chimneys or the roofs of the bungalows would have been secure, but when in contact they had been mutually destructive. If united, the various parts of a building, having different vibrational periods, should be connected by bonds so strong as to be constrained to move as a whole. Other observations indicated that in a severe earthquake the difference in phase of the portions of the building at the two sides of a crack sometimes reached two millimetres; from which it was deduced that portions of a building not likely to synchronise in their vibrational periods ought either to be strongly tied together, or else, by joints intentionally left during its construction, be completely separated from each other.

Finally, the author observed that in the construction of buildings in countries liable to earthquakes, the most important principles to be followed were: First, to provide against horizontally applied stresses; secondly, to allow all parts of the building with different vibrational periods either to have freedom amongst themselves, or else to bind them securely together with long steel or iron tie-rods, especially at the floors and near corners; and, thirdly, to avoid heavy superstructures. — *Engineering.*

Ordering Statuary for the Hartford Capitol.— In the Connecticut Legislature, January 13, a report was received from the special commission having in charge the matter of erecting statues of Connecticut historical celebrities on the exterior and interior of the State Capitol building. The general tenor of the report is against haste in filling fifty or more niches and other appropriate places, probably on the theory that Connecticut's great men are not all born yet. The report also intimates that there need be no haste in erecting statues, as proposed, of Gen. Thomas Spencer, of revolutionary fame, or even of Joseph E. Sheffield, who founded the Sheffield Scientific School at Yale. Their recommendations are that a life-size statue of Governor Oliver Ellsworth be procured, also a bas-relief of Thomas Hooker and his band coming through the woods from Massachusetts to Connecticut in 1630, and for a companion-piece as bas-relief presenting John Davenport preaching under the oak at New Haven.

THE 45° PLANE IN PERSPECTIVE.

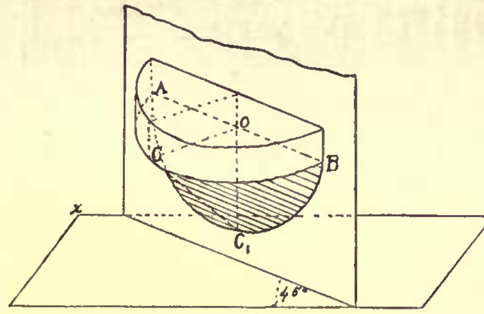


Fig. 1.

This paper is sent to us with the following explanatory note: —

"Inclosed please find a translation of part of a charming little treatise on "Conventional Shadows," prepared by E. Pillet, for his class in the Polytechnic School of Paris. It has for its object the finding of shades and shadows in elevation without the aid of the horizontal projection. The use of an auxiliary vertical plan , which is perpendicular to all vertical planes that contain conventional rays of light, together with the determination of curves by their tangents rather than by a multitude of points, forms, I think, the chief charm of the work. I have seen nothing of the kind that pleased me so much since Professor Ware's delightful 'Perspective Papers' appeared in your journal; and thought that perhaps some of your readers might find this simple method of determining shadows as new and interesting as it was to me."

The shadow cast by a horizontal circle upon a vertical plane making an angle of 45° with the vertical plane of projection, and perpendicular to all vertical planes containing conventional rays of light, is somewhat remarkable. (By abbreviation this plane is called the 45° plane.)

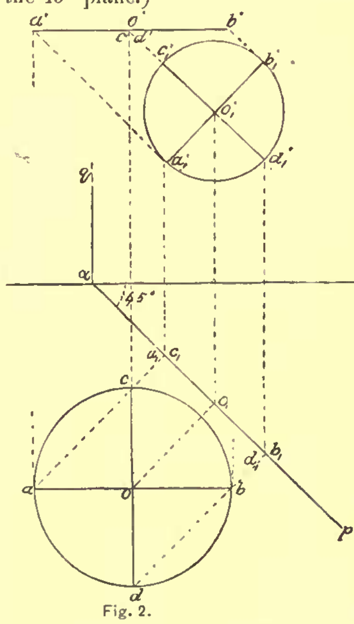


Fig. 2.

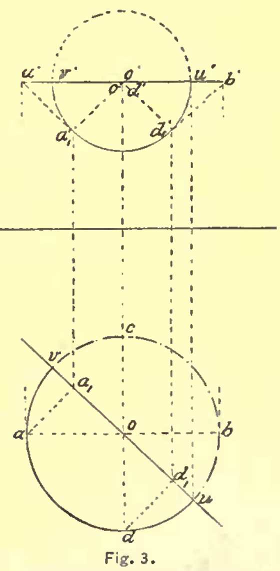


Fig. 3.

Let $a\ b\ c\ d$, $a'\ b'\ c'\ d'$, Fig. 2, be a horizontal circle; let $p\ x$ and $x\ q$ be the traces of the 45° plane. The centre o will cast a shadow upon this plane at $o'\ o'_1$ and the two diameters, ab and cd, the one parallel and the other perpendicular to the vertical plane of projection, will cast the shadows $a'_1\ b'_1$ and $c'_1\ d'$ both of which make an angle of 45° with the ground line.

It is easily seen that these two lines are not only perpendicular to each other, but are equal, hence the vertical projection of the elliptical shadow is a circle, Figure 2.

If the 45° plane passes by the centre of the circle, Figure 3, the shadow cast by it is very easily drawn in vertical projection. From a' and o' draw two lines $a'a'_1$ and $o'\ a'_1$, making angles at 45° with $a'b'$; then will $a'_1\ o'$ be the radius of the circle of shadow. The portion of the circle marked in full line corresponds to the half of the circle situated in front of the 45° plane.

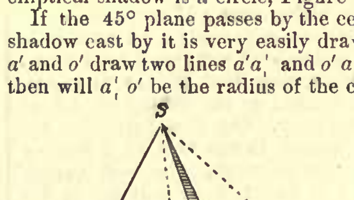


Fig. 4.

This 45° plane is much used. It will be used in this work whenever it is desired to determine the lines of shade and shadow in elevation, without having recourse to the horizontal projection or plan.

It will be used as an auxiliary plane of shadows for the purpose of applying the method of oblique projections.

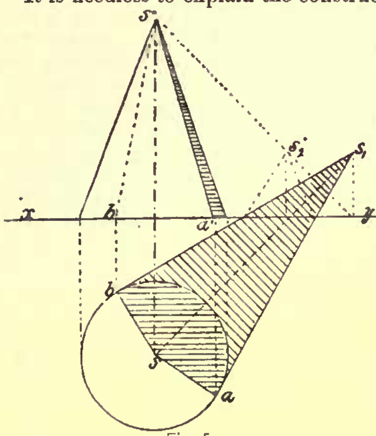
LINES OF SHADE OF SURFACES OF REVOLUTION.

The cone: Usual method.

The shadow S_1 of the summit S upon the plane of the base is found Figure 4; two tangents $S_1\ a$ and $S_1\ b$ are drawn from the point to the circumference of the base, which gives the shadow cast by the

cone. The line of shade is formed by two generatrices Sa and Sb drawn from the points of tangency.

It is needless to explain the construction in projection, Figure 5.


Fig. 5.

We notice that it requires a great deal of room, and that the plan is used.

The construction may be simplified, and the necessary space reduced, by using the 45° plane instead of the horizontal plane of projection.

Suppose a 45° plane contains the axis of the cone. Instead of finding the shadow cast by the vertex upon the plane of the base, the shadow cast by the base upon the plane passing through the vertex may be found.

This shadow is seen in the circle $a\ m_1\ b$, Figure 6, on the 45° plane. The vertex is its own shadow, since it is situated in the 45° plane. The two lines Sg_1 and Sh_1 tangent to the circle $a\ m_1\ b$, are the lines of shadow cast upon the 45° plane; and the luminous rays passing by the points of contact g_1 and h_1 give in g and h, upon the base of the cone, the points of the generatrices sought, which are the lines of shade.

It is easily drawn in projection Figure 7. The circle, which has $o'q'$ for radius, is the shadow of the base on the 45° plane.

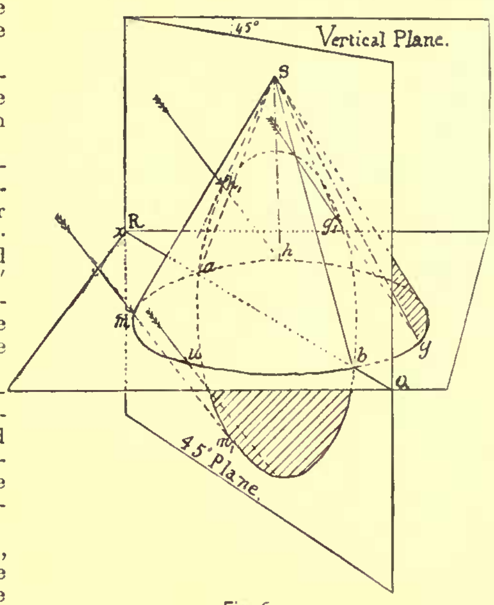


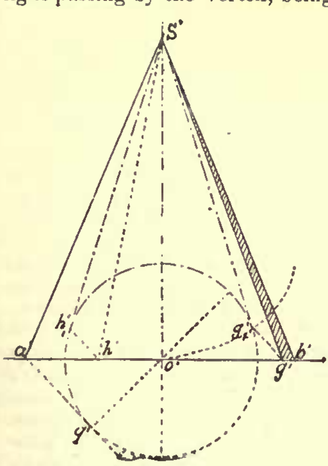
Fig. 6.

The points of tangency to this circle of lines drawn from S' are found in h'_1 and g'_1 by describing an arc of a circle whose diameter is $S'\ o'$, and the luminous rays $h'_1\ h'$ and $g'_1\ g'$ give in $S'\ g'$ and $S'\ h'$ the generatrices which are the lines of shade of the cone:

Thus the construction is considerably reduced, and the operations performed within the limits of the apparent contour.

In the cone, whose angle at the base is 45°, the line $S'\ a'$, of the apparent contour, is one of the generatrices of shade; the other is the generatrix $S'\ c'$, coinciding in projection with the axis, situated upon the concealed portion of the cone. A fourth of the surface is in shade. (See plan, Fig. 8).

The cone, whose angle at the base is ϕ, has no shade. The ray of light passing by the vertex, being itself inclined at the angle ϕ, does not leave the surface of the cone. The two generatrices of shade are reduced to one, which is confounded with the luminous ray.


Fig. 7.

If the angle at the base is less than ϕ, the cone, for the greater reason, has no shade.

Line of Shade of the Cylinder.

If the cylinder is considered as the limit of the cone whose vertex is at an infinite distance, the shadow cast by the vertex will also be at an infinite distance, and the two tangents to the base become lines making angles of 45° with the base line. The line of shade is $c'\ d'$, Figure 9. From the figure we have $X = R\frac{\sqrt{2}}{2} =$ approximating .o 7 R.

The 45° plane would have led to the following solution: Draw $o'\ h'$ and $a'\ h'$, inclined at 45° in two directions, and revolve $o'\ h'$ about o as centre until it reaches the position $o'\ c'$, and draw $c'd'$ parallel to the axis.

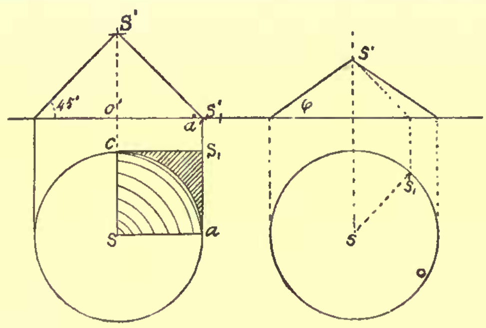
The Line of Shade of the Torus.

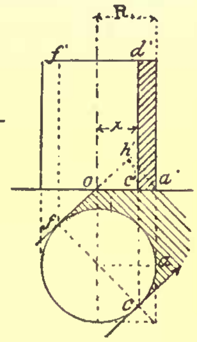
The points a' and b' upon the apparent contour are obtained by drawing the tangents at 45°

The point c' projected upon the axis being symmetrical with the point a', is found by drawing the horizontal line $a'\ c'$.

The point d' upon the equator is found by means of the arc $d'\ g'$, constructed as we have just seen for cylinders.

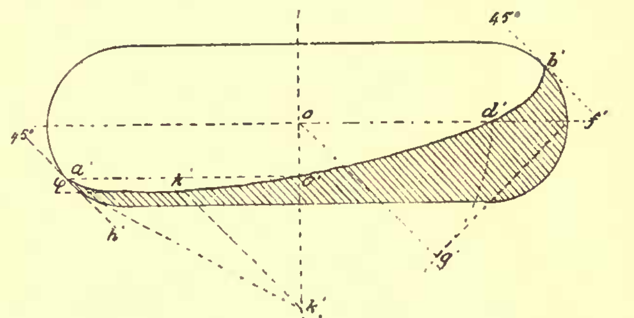
To find the lowest point, k', the method of secant planes is applied. The meridian at 45°, parallel to the rays of light, is supposed to be revolved about the axis of the torus into the plane of


Fig. 8.


Fig. 9.

the paper, taking with it the tangent luminous ray, which is consequently projected at an angle ϕ. Hence the line $\phi\ k'$, making an angle ϕ with a horizontal, is drawn tangent to the principal meridian. Then, by an inverse rotation, the point of tangency ϕ is brought back into its place.

In this movement the point k', situated upon the axis, does not move; the point ϕ will be displaced horizontally; and the luminous


Fig. 10.

ray at an angle ϕ will again be projected in a ray, $k'_1\ k'$, at 45°, which will give the lowest point, k', of the line of shade, the tangent at this point being horizontal.

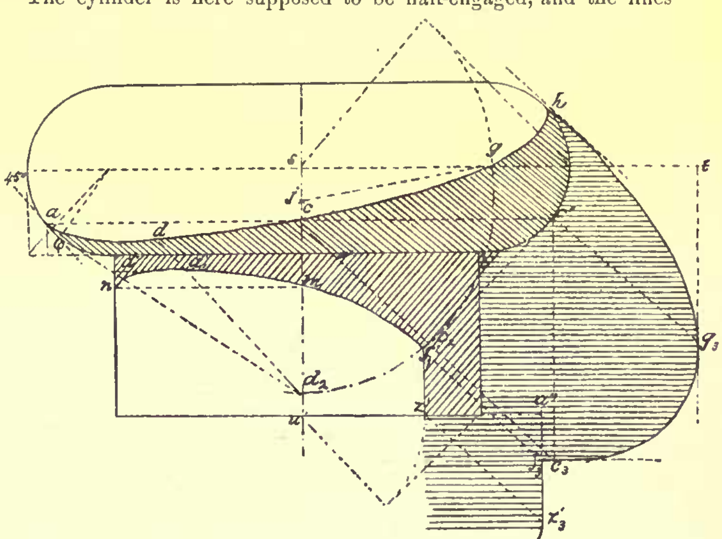
In this manner five points are rapidly obtained with the tangents at three of them, which is abundantly sufficient for the practical construction of the curve.

It is evident that, upon all other surfaces of revolution, the lines of shade may be found by the same rapid process.

The Shadow of the Astragal.

The shadow cast by a torus upon a vertical cylinder having the same axis as itself is thus designated.

The cylinder is here supposed to be half-engaged, and the lines


Fig. 11.

of shade of the torus and cylinder are found, as has already been described.

The highest point, d'_1 of the line of shadow, will be in the meridian whose plane is parallel to the rays of light.

By rotation about the axis of the cylinder this meridian is made to coincide with the principal meridian. The tangent luminous ray

$a\,d^2$ will then be projected at an angle ϕ. It pierces the cylinder in the point d'', which is brought into place by an inverse rotation: — d'' remains in the horizontal $d''\,d'_1$;—the ray $a\,d_2$ intersects the axis of the cylinder at d_2, and in the revolutions the point d_2 remains stationary; hence $d_2\,d'_1$ at 45° is the projection of the tangent ray of light, and d'_1 the highest point of the line of shadow.

The point of disappearance f_1 is found by finding the shadow $d_2\,c_2\,g$, cast by the torus, or, what amounts to the same thing, by the line of shade of the torus, upon the 45° plane.

It is easily found: the point g, situated upon the equator, being itself situated in the 45° plane, is its own shadow (tangent vertical). The point c, projected upon the axis, casts a shadow at c_2 (tangent at 45°). The lowest point, d, casts a shadow, d_2, upon the axis (tangent horizontal).

This auxiliary curve is, then, easily traced. It resembles an ellipse, but is not one. Its intersection, f_1 with the line of shade of the cylinder, is the point of disappearance sought (tangent at 45°).

Having the point d'_1 and f_1 with the tangents at these points, the curve $d'_1\,m\,f_1$ is easily drawn. The meridian projected in the axis being symmetrical with the apparent contour, the point n, on the apparent contour, will be symmetrical with the point m, where the curve, $d'_1\,f_1$ intersects the axis; it is found by drawing the horizontal, $m\,n$, the tangent at n is the apparent contour.

The Shadow Cast upon the Wall.

The line of shadow begins at h. The tangent is at 45°, for this tangent will be part of the apparent contour of the cylinder of shadow in space of the line $a\,d\,c\,g\,h$.

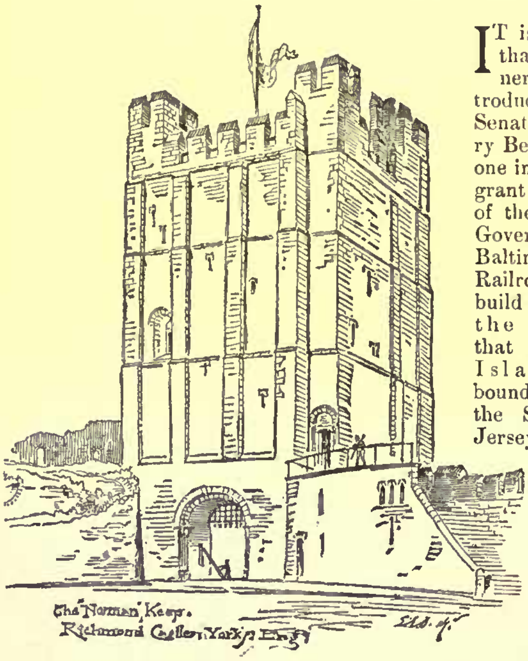
The point upon the equator, g, casts a shadow at g_3, obtained by laying off $gt = gs$; the tangent at g_3 is vertical, for the plane tangent to the torus at g is vertical.

The point c, situated upon the axis in projection, casts a shadow c_3. Since the distance of the point c, in front of the wall, is equal to the line cc'', the point c_3 is situated upon the vertical $c''\,c_3$. At the point c_3 the tangent is horizontal, for the plane that is tangent to the torus at c is parallel to the ground line.

The line of shade of the cylinder, f'_3z', casts a shadow, $f'_3\,z'_3$, obtained by laying off $Z'U'' = Z'U'$. Finally, the point of disappearance, f_1 casts a shadow f'_3, on the line $u''\,z'_3$.

Notice. — When the torus is generated by a very small semicircle, as in the astragals of columns, instead of $d_2\,c_2\,g$, the auxiliary curve of shadow cast upon the 45° plane, a quarter of a circle is substituted; the centre of the circle being taken at j, about a third of the distance $c\,s$ above the point c; and $j\,g$ being taken as a radius. This approximate curve is used in the same manner as we have just used the true curve $d_2\,c_2\,g$.

THE BALTIMORE AND OHIO RAILROAD BRIDGE AT STATEN ISLAND, NEW YORK.



IT is announced that Senator Warner Miller has introduced a bill in the Senate, and Mr. Perry Belmont a similar one in the House, to grant the permission of the United States Government to the Baltimore and Ohio Railroad Company to build a bridge over the narrow sound that divides Staten Island from the boundary shores of the State of New Jersey — called, in the early Dutch settlement of the country, the "Arthur Kill." The application for this permission thus sought by the passage of these bills, is made necessary because of the fact that this narrow inlet is recognized as a part of the navigable waters of the United States, and thus subject to the jurisdiction of the Federal government. The ulterior aim and object of the Railroad Company being to connect its line with the port of New York, it has decided to build a branch from Bound Brook to connect with the present Rapid Transit Road on the north shore of Staten Island, and thus command and secure a grand enterpôt on the shores of New York Bay, at a very eligible point upon the Island and at the deep waters of the harbor.

But it is said that, while to erect the bridge it is necessary to obtain such permission from the United States Government, the actual authority to build it can only be obtained from the Legislature of the State of New Jersey. Of course that of the State of New York must also be obtained in the matter, since the easterly shore of the Sound is included in the latter State, but this phase of the subject is not particularly alluded to in the discussion, since it is conceded that such consent can be had for the asking, if not already granted in the charter of the present Staten Island Road. As to New Jersey, its public men have already, with some exceptions, expressed themselves as averse to the grant, pointing out that it is not to the interest of the State to have such a terminus located upon land within the State of New York, when there are so many equally desirable locations to be found on the New Jersey shores of New York Bay — and which may be reached either by constructing a bridge over Newark Bay, or by extending the road farther north and across the Newark Meadows. In fact, a negative law is said to exist on the statute books of New Jersey now, forbidding all persons from erecting any such bridge, except by the especial authorization of the Legislature.

On the other hand, the railroad men say that the New Jersey shores on New York Bay, along the whole extent of Bergen Neck, are shallow, and cannot be utilized for the purpose of a harbor except at great cost in dredging artificial basins, etc. At Bergen Point, on the Kill-von-Kull, and at Constable Hook, deep water exists, but the Standard Oil Company, and other oil, coal, and manufacturing companies, have monopolized the best locations, and other reasons exist which make a terminus on the Kill-von-Kull much less desirable than on the open Bay.

As to the condition of the inland waters of this part of New Jersey, they are all, except in the narrow channels, shallow, and when the tide runs out the greater portion of their wide shelving shores is laid bare. When thus exposed to the action of the sun and air, these muddy reaches of shore in the bays, rivers and creeks, generate a miasmatic combination of gases, which contaminate the atmosphere in the fields, the meadows, the villages, and even the cities of a widely-extended section of the State. To the evil of the agues and fevers bred from this cause, is to be added the annoyance of mosquitoes, which flourish most in such periodically overflowed marshes, and amid the mephitic vapors which they generate.

Wide meadows extend from the shores of Newark Bay to the west and north, and those upon the west, which extend a great part of the distance towards the City of Elizabeth, are overflowed at the rise of every recurrent tide, only to be in turn left bare and dripping with an oosy and muddy coating at the fall thereof. And this operation continues to repeat itself, twice in every twenty-four hours, "forever and forever."

The meadows at the north, however, have been dyked so as effectually to prevent the overflow; but the shores of the streams which run through them, are still exposed to the deleterious action of the tides in this respect; the Passaic River, which borders the populous City of Newark, not being exempt from this action.

On the borders of Newark Bay, and at various points in the Passaic and Hackensack rivers, and in the larger contiguous creeks, wharves and bulkheads, have been erected here and there for the accommodation of shipping — here confined, of course, to vessels of limited tonnage,— and these wharves can be approached only at high tide, when a few feet of water is then obtained to float the loaded boats. When lying at these docks at low tide, the vessels rest upon the bottom, and can only be made to float and depart when the waters, returning upon the next incoming tide, give them the necessary buoyancy to permit their sailing away. At a few docks, at the large manufacturing establishments at Newark, Harrison and Elizabethport, the necessary dredging has been done to connect them with the channels, and relieve them from their inconvenience, but all the remainder of those shores are subject to this annoyance.

And south of Elizabethport, in Elizabeth Creek, in the Sound, in the Rahway River down to and including the Raritan itself, the same shallow depths of water extend, and the same unfortunate hindrances to the satisfactory navigation of those waters exist. At many of the docks the shore is laid bare at low tide far out beyond the end thereof, and at some of them in Newark Bay, no vessel used for freight can approach at such time within a half mile of them. Wide flats at many places extend a long distance out from the shore, with a depth of not more than three feet of water upon them, making the approach of any vessel of average magnitude impossible.

Now here we have a great evil crying aloud for remedial action, and the State might well consider any company or government that could relieve her in these respects, as nothing less than a benefactor. Imagine these shallow places covered constantly with about eight feet more of water than they now have at low tide — not only when the tide has run in to its greatest height, but at all times constantly; and this abundance of water continuing permanently without change, from New Brunswick to Jersey City, in all the bays and streams. What an increase of commerce would immediately result! How changed would the relations of these interior towns become to those of the outside world. This would be a boon indeed.

On the other hand, we have the Baltimore and Ohio Railroad Company, earnestly desiring to reach a coveted terminus on the waters of New York Bay, but hindered by the opposition it finds in the minds of the legislators and interested parties in the State. The legislators and statesmen object to their State being made a transit ground for the benefit of other States; and the officers of other railroad companies who have already secured the right of

way, are naturally opposed to their rivals obtaining the same concessions. On all sides we hear the cry, "Hands off! You build no bridge there!" and in this state of mind the parties stand facing one another.

Why cannot a compromise be made and both parties be relieved of their grievances at once, and great good be thereby accomplished, to the enrichment and increase of the happiness of the people? Let us see if this cannot be done. It may be necessary in doing it to call upon the Federal Government for assistance, but no doubt the Railroad Company will be found willing to do its part. From the westerly extremity of Bergen Point let a dam be thrown across the Kill-von-Kull, and from the southerly end of Staten Island extend another dam across Raritan Bay to South Amboy. Let these dams be constructed of a height sufficient to retain the water on their westerly sides constantly on a level of eight feet above low tide; or of such a height as may be found to be the most convenient for navigation, at the same time having regard to the necessity existing of not overflowing the meadows too much at the north end of Newark Bay. In connection with these dams construct the requisite locks to transfer vessels from one level to the other. Over these dams build railway bridges, which will thus afford to the Baltimore and Ohio Railroad Company the entrance which it seeks into Staten Island, and which at the same time will enable the present road running to the south end of the island to form a connection with the main land. The present bridge across Newark Bay may be widened to give access to the new bridge over the Kill-von-Kull, and the proper draws provided at the locks in both dams.

These works would not be any more extensive than those carried out by the Government at Sault St. Marie, at the entrance to Lake Superior, and are entirely practicable. Six feet of the extra water behind the dams would be contributed at high tide, and the excess over six feet would accumulate from the supply of fresh water from the rivers. After the requisite height is obtained in this manner, the surplus would be constantly overflowing from the dams, and thus tend to keep the waters pure. This fresh water would also afford the necessary supply to work the locks. These latter should be large enough to accommodate the increased number of vessels that would visit the inland ports, when the navigation would be thus so extensively improved; they should be of size to receive not only large vessels, but quite a number of such at one time. At high tide the fall would be only two feet, at low water eight feet. The power developed by this fall could be utilized to work the locks by water-engines, as at the locks of Sault St. Marie, and might also furnish surplus power to work a number of tide-mills. A royalty might be collected on this water-power sufficient to pay the expense of working the locks.

Here is a plan, then, by which the Baltimore and Ohio Road can obtain the end it has in view, and the State of New Jersey receive its just proportion of the annual appropriations made by Congress in the River and Harbor bill. Some time or other this work will have to be carried out, and no better opportunity than the present to effect it is likely to occur for years to come. The cities of New Brunswick, Perth Amboy, Rahway, Elizabeth, Bayonne, Newark, Harrison, and even Jersey City, are immediately interested in its success, and would be, no doubt, willing to make extraordinary exertions to secure the coveted bridge to the railroad on these conditions.

O. P. HATFIELD.

SOCIETIES

THE ASSOCIATION OF OHIO ARCHITECTS.

AT a convention of the architects of this State, called at Columbus on the 12th inst., by the Ohio members of the Western Association of Architects, a large number of prominent members of the profession were in attendance. After the convention was properly organized, an association was formed, called the Association of Ohio Architects, its object being to unite in fellowship the architects of the State, to combine their efforts so as to promote the artistic, scientific and practical efficiency of the profession, and to cultivate and encourage the study of kindred arts.

A number of questions of interest to the profession were discussed.

A committee, consisting of J. W. McLaughlin, Samuel Hannaford and Charles Crapsey, of Cincinnati, was appointed to act in conformation with the Builders' Exchange of Cincinnati, in preparing an act (now under consideration by the Builders' Exchange) to regulate the construction and plumbing of buildings, within any city of the first class, and to provide for the appointment of a building inspector.

The following officers were elected for the ensuing year, viz.: —

President, George W. Rapp, Cincinnati; Vice-Presidents, Samuel Hannaford, Cincinnati; J. H. Kremer, Columbus; Levi T. Scofield, Cleveland; E. O. Fallis, Toledo; C. I. Williams, Dayton; Secretary, Oliver C. Smith, Cincinnati; Treasurer, H. C. Lindsay, Zanesville; Executive Committee, Geo. W. Rapp, *ex-officio;* I. W. Yost, Columbus: Chas. Crapsey, Cincinnati; Jas. W. McLaughlin, Cincinnati; F. O. Weary, Akron.

The next semi-annual meeting of the Association will be held at Cincinnati on the third Thursday of next July.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

THE SAFE-LOAD ON A FIXED SLAB.

BATH, Me., January 21, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Would you be so kind as to inform me how to calculate the safe-bearing load of a slab of stone firmly fixed on all four sides. I cannot find anything relating to it in any text-book.

Respectfully yours, A. H. B.

[THE description is not definite enough. Does the slab act as a lintel or a cantilever, or bow.—EDS. AMERICAN ARCHITECT.]

THE DEUTSCHES BAUHANDBUCH.

PITTSBURGH, Pa., January 19, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Will you be kind enough to let me know if the "*Deutsches Bauhandbuch*" can be procured in New York or Boston, and if so, from whom? What is the probable price here? An answer will oblige. Yours truly, READER.

[ALTHOUGH we do not find it in their catalogue, we believe the most ready way to obtain the "*Bauhandbuch*" would be to write to E. Steiger & Co., 25 Park Place, New York.—EDS. AMERICAN ARCHITECT.]

A QUESTION OF COMMISSION.

ELMIRA, N. Y., January 14, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Please favor us with your advice as to what to do under the circumstances of which the following is an outline:

We were employed to make preliminary drawings and estimates for two trade-school buildings, for a State institution, late in the fall of 1884. Our estimate for the building was about $22,000. The drawings were approved, and the Legislature appropriated $20,000 for the erection of the building. We were then directed to complete the plans and specifications, which we did, and contracted the work to responsible parties for $20,050. A clerk-of-works was appointed, and the building satisfactorily erected, accepted, and paid for. The clerk reported to us as often as was required, and we made numerous visits of supervision. The character of the building was such that we did not make out our bill at the regular rate of five per cent, but presented a bill at three and one-half per cent on $20,050. Shortly after we received the following reply:

December 17, 1885.

TO MESSRS. PIERCE & DOCKSTADER: —

Dear Sirs,— Yours, etc. (Nov. 16), was by the managers to-day referred to myself for adjustment. You will remember at the time I called on you to do this work I stated that I had no authority to agree as to payment, but that no doubt the managers would allow you fairly for it, etc. I believe the usual etc. should not govern the architect's charge for this work, but that a fair compensation, without regard to percentages, should be paid. This, from my own point of view, seems to be demanded for the appropriation is more than expended. 'Tis overdrawn. If it was left to myself to decide I would recommend $300 as a suitable sum for the service rendered. If this is satisfactory I will try to procure a cheque for you at once.

Very truly yours, ———, *Manager.*

A word as to the character of the buildings:

One building was 240 feet by 60 feet, two stories high, the second floor for machinery carried on iron columns, and the roof trussed. At one end it was necessary to carry it over a 25 foot roadway, necessitating careful computations for both girders and an arch, at the manager's request. The other building was one story high, of such form as to require two separate designs for trusses to carry the roof. Being a penal institution extra care had to be taken to make provisions for exigencies which might arise, and the prevention of escape. The buildings were built of brick and stone, with slate roof, but left without plastering, or casing the windows inside.

Are we not entitled to the regular fee of five per cent, and if it were a private institution could we not collect that for our services, after deducting the amount paid for the preliminary drawings? We made this deduction from the bill we presented.

Very truly yours, PIERCE & DOCKSTADER.

[WE do not see why our correspondents did not earn the usual commission of five per cent, and, in the absence of a previous agreement they would probably have found it easier to collect this in full than a charge in which they make an arbitrary discount from the customary fee. Obviously if they value their own services at less than the current rates, it is natural that their client should infer that a still smaller compensation might be accepted; and they have then the trouble of showing that what they have done was worth just the amount they charged for it, and of explaining why it was not worth as much as architects generally get for the same service. The manager seems to have simply made a sort of preliminary offer on his side, and not to have closed his mind to evidence as to the proper compensation, and we should advise going to him frankly and showing him by such memoranda as may be at hand, the actual amount of time and money expended

on the work. To the value of this, reckoned at a fair compensation for a professional man's time, must be added the value of the responsibility undertaken by the architect, which was set by the judge in a recent French case at about one and one-quarter per cent on the cost of the building; so that it will probably be easily shown that the charge made is a very moderate one, and there should then be no difficulty in getting the full bill approved and paid.—Eds. American Architect.]

THE RECORDED COST OF BUILDINGS.

New York, January 22, 1886.

To the Editors of the American Architect: —

Dear Sirs, — As one who, though not a professional, takes a great interest in all that pertains to architecture, I desire to ask a question or two. In your weekly *Building Intelligence*, you give the *cost* of the various buildings, residences, etc., in course of erection. Now is it, in each case, the actual cost at which the same work can be duplicated, or are the prices annexed fictitious? My reason for asking is, that, in discussion with an architect on this subject, he scouted the correctness of the figures, and intimated that they were doctored for the purpose of reducing the assessments. As I contemplate building, may I ask an early reply? As a subscriber I remain,

Yours truly, L. G.

[Our impression is, that your architect is right in believing the estimates are generally "doctored." At the best they are merely approximate, sometimes indicating what the client is willing to spend, sometimes what the architect thinks such a building ought to cost, and sometimes what the builder says he will build it for. As for duplicating, we question whether the same builder would often agree to do indentical work for an equal price; and as for different conditions or localities, it would be always — almost — out of the question. — Eds. American Architect.]

SUNDRY QUESTIONS OF PRACTICE.

January 22, 1886.

To the Editors of the American Architect: —

Dear Sirs, — 1. What is, or was, the oldest clock-tower in the world? Was the clock on the belfry of Bruges an after-thought?

2. What is the best way of fastening a mantel-shelf to a chimney having 8″ walls; there is no furring. Would wooden 4″ plugs be safe?

3. Is plastering on inside walls durable, when put on and allowed to dry in freezing weather?

4. Should bricks be wet when laid in lime-mortar and cement, and lime-mortar, as well as when laid in cement? Does this apply when freezing is likely to take place in the night? Some masons prefer to lay bricks dry in cold weather, regardless of the kind of mortar used.

5. In deafening floors, should the mortar be brought up flush with top of joists — or a slight air-space left? Mason.

[2. As there is no furring, wood-bricks might be used, if no particular value were placed on the mantel-shelf. Porous terra-cotta bricks would be the best thing to use. 3. Why not, if the plastering itself is not allowed to freeze? 4. Bricks ought always to be wet before laying, and they ought never to be laid in freezing weather. If laying in freezing weather is unavoidable, the brick should not be used wet and *frozen*. Some advise mixing mortar with salt water during frosts, and there are cementing materials, like asbestine plaster, which are said not to freeze. 5. Deafening between joists is not so effective as when the deafening material is spread over the entire floor area; an air-space is usually left. — Eds. American Architect.]

FROZEN PLASTERING.

Greenville, S. C., January 18, 1886.

To the Editors of the American Architect: —

Dear Sirs, — Any light on the following will be regarded as a favor. On the night of the 15th a roof sprung a leak near a chimney, and on visiting the house the next morning I found about eight feet of plastering saturated. On examination, I found that a stream had run down the side of chimney-stalk from roof to ceiling, and there was a coating of ice over the chimney, but the eighth-of-an-inch of water standing on the lath and plaster was not frozen. The plastering is now separating right between the scratch and brown coats. The plasterer holds that this is entirely due to the effect of the water. I hold that the water only hastened what would have occurred sooner or later, on account of bad plastering. I think the scratch coat, or the browning, or both, were frozen by a cold snap about two weeks ago when they were being applied. I have seen plastering saturated by a leak three times or more, and then dry out and hold. I can see no reason in the assertion that old plastering would stand, after the leak had caused it to be saturated, but that new plaster would drop from the "scratch" coat. If you see anything of common interest in an explanation of the above, please favor me in your correspondence column. Respectfully, E. B. Rutledge.

[We could hardly tell, without looking at the plastering, whether either coat had been frozen or not. The effect of slight freezing on either the scratch or brown coat, would be to cover it with long, needle-like, crystalline lines, and, after thawing, the surface would be permanently soft and powdery, and inclined to separate from the mortar below. If the brown coat, in coming off, brought with it an eighth of an inch or so of the scratch-coat, we should say that this indicated the previous freezing of the scratch-coat. If, however, the brown coat came away by itself, leaving the original surface of the scratch-coat nearly intact, we should think that the scratch-coat had not been sufficiently scored, and that it had, perhaps, not been properly wet before applying the brown coat, or had been allowed to get dusty. Although we should be more inclined to expect that a prolonged soaking would destroy the clinch of the plastering, and detach it all together, it might happen that water would work its way between two imperfectly-adhering coats and separate them, when, without this, they would have remained in proper connection.—Eds. American Architect.]

TRADE SURVEYS

That which most concerns the business interests, is the maintenance of a profitable market, wherein all the diversified products of mental and physical labor will find ready buyers. The possibility of the recurrence of industrial depression is never absent from prudent men's minds. How to maintain activity, is no ordinary problem. How to avoid depressions, is the other side of the same problem. The investigations made on both sides of the Atlantic, with flourishes of legislative trumpets, have simply reiterated well-known facts. No remedy has ever been devised or applied. In our short-sightedness, we imagine that these depressions are terrible, and ought to be guarded against. On the contrary, they are the phases of development which must of necessity, moral and economic, be passed through. The mistaken efforts put forth to find a foreign market to absorb our overplus, may work in breadstuffs and raw products; but not in manufactured products, because of the vast sea of cheap labor, and the prejudice and intellectual sloth that envelope the consumptive capacity of outside nations. Our great market must be found at home.

The first month of the year has made a fair record for itself, both in realizations, and in reasonable assurances extended. The upward spurt of prices checked building demand. Less business has been done than in December; but on the other hand more inquiries have been made this month, than were made during the last three months of last year. The conditions are favorable to enlarged industrial, railroad and building operations. Conservatism is exhibited at every step so far. There is, as has been often remarked before, a sufficient volume of money for all probable or possible demands. The enlargement of shop and mill capacity referred to, has not been checked.

The architects are in a joyful mood over the commissions given for important building operations. In New York this week, work estimated at $3,000,000 was placed in hand, and the best authority there among architects states that the recent developments in and near that commercial centre, justify all the rather sanguine predictions that have been made. The usual crop of building-permits will soon be ready. So far as the facts warrant just now, it is correct to say that the building of apartment-houses will receive full attention, both in New York and Brooklyn. Speculative operations in Manhattan real estate are probable. There is a strong pressure to get farther out. The fashionable centre is slowly moving uptown, and as a result, certain sites are likely to change hands at no distant day. The industries of the city and State are healthful. In New York city labor organizations are very strong, and a somewhat general advance either has been, or soon will be made in rates of wages.

Throughout New England also, the tendency is to higher pay and to more frequent payments.

The Philadelphia architects are in a happy frame of mind, over the assurances extended, in the prospects as to the size and frequency of urban and suburban real-estate operations, and the looming-up of building operations, some of them of extraordinary proportions. Cottage-building, frame, will receive attention; but as a rule, builders will use brick and stone. Still, there is an increasing percentage of builders manifesting a preference for neat and substantial frame dwellings, wherein variegated hard woods are made to produce excellent interior and exterior architectural effects. This threatened departure however, has not the consent of recognized authority; but in these days of crazy-quilt freedom, there is no arbitrary rule to cramp the preferences of those who have money to build, and taste to gratify.

The Western cities and towns, even in this mid-winter season, are arousing their energies for an active year. Several new recruits in the way of enterprise have joined the army of progress. The extension of railroad construction is becoming every week more and more assured.

Pennsylvania iron and steel makers have, within a few days, booked some very large orders. One Philadelphia ship-builder, closed contracts within a few days, for the building of two passenger steamers, and two large tugs. All the Delaware River ship-builders have picked up considerable work. The Lake boat-builders have three months' contracts on hand, and the car-builders, as heretofore observed, are crowded with work for the winter.

Manufacturers in all lines of production, seem assured of better margins. Machinery manufacturers have their order-books quite full.

Chicago architects have within a week or two, undertaken preparatory drawings for warehouses, churches, banks and work of a more or less public nature on a large scale.

Confidence in the resources of the mighty Northwest, is attracting capital from Eastern cities, to Chicago, Minneapolis and St. Paul, for better investment under watchful eyes, and the Chicago and Northwestern architects generally voice the sentiment of the people, in saying that house and manufactory and public-building work will be exceptionally heavy.

The Western architects are giving no small degree of attention to the formation of compact organization for mutual protection. The spirit of fraternity is always stronger in newer and rising communities, partly because the necessity for organization is greater. Within a year many young architects have pitched their tents in the Western metropolis, and will, in due time, furnish evidence of their good teaching.

Prices for building material have not changed. Lumber is nominally, slightly higher, owing to some little fluctuation of freight rates, or fear of fluctuations. Stone will be more abundant this year, and freight rates about the same. New sources of supply will be developed, but will not materially interfere with the demands on the Rutland and Maine quarries.

Within sixty days, new saw-mills will be at work in the Virginias, Kentucky, North Carolina and Georgia and the available supply of hard woods will be increased largely.

Randolph Rogers's Gift of Casts to Ann Arbor. — The first instalment of the great collection of models and casts of statuary which comprises all the works executed by the sculptor, Randolph Rogers, of Rome, during his active life of thirty-five years, and presented by him to the University of Michigan, has been received. It consists of fifty-five large cases, containing, besides other works of art, statues of Abraham Lincoln, John Adams, America, Victory, Nydia, group of Indians, and various medallions and figures on soldiers' monuments in this country. The rest of the collection will be sent soon.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 528.

FEBRUARY 6, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

A PROPOSITION has been made in Boston, which seems to find support in the Municipal Council, to abolish the office of city architect, which was established ten or twelve years ago, and has been filled ever since in a manner very acceptable to the people of the city, and creditable to the gentlemen who have held the position. It is, however, beginning to be recognized that an official architect, although useful in giving intelligent care to the public property which is, or ought to be, placed under his supervision, rarely succeeds in bringing distinction to the city which he serves through the conspicuous beauty or fitness of the buildings which he designs for it. No matter how brilliant his talents may be, he is too firmly bound down by routine and precedent, and is too much under the direction of persons who know of no way of doing anything properly but the way in which they have always seen it done, to attempt with success any striking deviation from the traditions handed down in his office, even if he could command the time necessary for studying out thoroughly a new solution of a familiar problem. There is something to be said in favor of the view that an official architect knows, better than any one else, the requirements to be fulfilled in the designing, for instance, of a school-building, after the taste of the community in which he lives, and is less likely to make mistakes in planning them than architects who have not learned these requirements by heart; but there is more to be said, we think, for the opposite view, that in these days of progress innovation and experiment are necessary to healthy growth; that in architecture, particularly in that special branch of it which relates to the construction of school-houses and public buildings, the gradual adoption of a set of stock patterns, which is almost inevitable in official practice, brings on a paralysis of development which soon leaves the town suffering from it far in the rear of communities which know how to call with effect upon the profession at large for the services that it needs. It is true that outside architects often make what city committees are pleased to call mistakes in solving the problems placed before them, but the real mistakes that men of skill make in their professional work are not often serious, while the differences of opinion in regard to details of planning or design between them and their committees which the latter are apt to consider faults on the others' part, are rather advantageous than otherwise to the community. As every architect knows, many of the formulæ of school-planning which were regarded as indisputably correct ten years ago, and are still cherished by school-committees, are to-day abandoned, and different rules have been proposed, to which the public must be educated by the efforts of the profession which learns them the soonest and understands them the best; and unless the services of the best professional skill in any community can be enlisted in public work, that work ceases to represent, as it should, the highest attainments of that community. Our cities have, in a great degree, lost that spirit of rivalry which once urged them to put forth their best efforts to surpass each other in good works. With most towns the main object is to get over a public undertaking, no matter how important it may be, as cheaply and with as little trouble as possible, and the result of this method of carrying on such business is becoming rather painfully apparent.

MR. J. G. BATTERSON, a gentleman well known personally to many architects, and by reputation to nearly every intelligent person east of the Mississippi, has undertaken an experiment in participation at the great New England granite quarry at Westerly, R. I., which bids fair, through the care with which the details are studied, and the characteristic clear-headedness with which the objects to be attained are set forth, to become the most important example of the kind on this side of the Atlantic. According to the printed letter containing the offer made by Mr. Batterson to his men, it is proposed that, during the year 1886, the profits of the quarry business shall be divided between the owners and the workmen, according to a rather novel, but sensible, plan. In brief, the capital employed in the business, and the value of the labor employed during the same time, are treated as equal partners, sharing in the profits according to the amount of money represented by each, and, to a certain extent, sharing also in the losses. This last is, to our mind, a particularly good feature of the scheme, on account of its value in educating the workmen to the anticipation of the losses which are inevitable in every real business, and which must be provided for in times of prosperity, and it is introduced in the simplest way. Supposing the capital employed during the year in paying workmen, buying supplies, and so on, to be one hundred thousand dollars, and the whole amount paid for wages through the year to be one hundred and fifty thousand, the value of the output of the quarry ought, Mr. Batterson thinks, to be about four hundred thousand dollars, which should, in favorable times, bring in a net profit of twenty-five thousand dollars. One-third of this profit, or eighty-three hundred and thirty-three dollars, which is a trifle more than two per cent on the supposed amount of sales, is to be put aside as a guarantee fund, from which to make good losses caused by bad debts; while the remaining two-thirds is to be divided between the stockholders, who furnish the capital, and the workmen, in the proportion of two-fifths to the former and three-fifths to the latter. In this way each workman is treated exactly as if he had invested in the company, during the year, an amount of capital equal to the value of his wages for the year; and he draws, in this case, a dividend of six and two-thirds per cent upon it, just as the stockholder draws his upon his cash investment. The result is, that each man who has worked through the year draws twenty days' extra pay as his dividend, amounting to sixty dollars for a man whose wages average three dollars a day, and more or less with others. Beyond their part of the guarantee fund, the workmen are not called upon to contribute anything for making up the losses of the year; the stockholders agreeing to make good any excess of losses beyond the two per cent represented by the fund, and having, in turn, the right to any surplus if the losses should be less than this. Machinery is to be regarded as partaking of the character of both capital and labor, and the earnings of the quarry machines are to be divided between stockholders and men, in the same proportion as other profits. The rates of wages, both for day-work and piece-work, are to be determined by mutual agreement on or before the first day of January in each year, and any disagreement between the superintendent and the men in regard to them is to be decided by arbitration. No advance or reduction of wages is to be made, either by the superintendent or the men, in such a way as to affect contracts made on the basis of a previous scale of wages; and workmen who are discharged for good cause, or who leave the employment of the company without the written consent of the superintendent, are not to be entitled to share in the dividend. Men, however, who are discharged because there is not work enough to justify keeping them, are to be entitled to their part of the annual dividend.

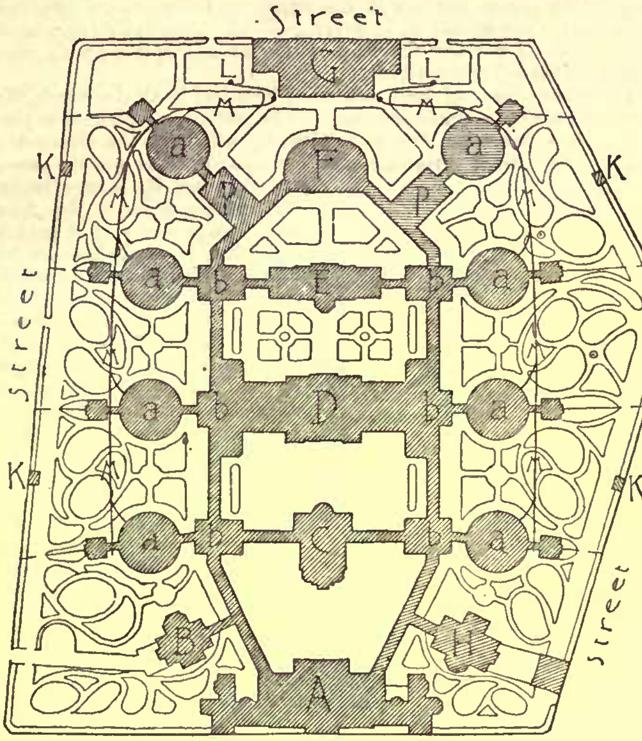
THE comments of Mr. Batterson on his scheme are not the least interesting part of his letter. In his opinion, which is founded on long and extensive experience, the system of payment of fixed wages tends "to indifference and laziness,"

while payment by the piece not only brings deserved reward to the energetic and skilful workman, but is most profitable to the employer; and he therefore argues, as does every one who speaks with any intelligence on the subject, that the introduction into the relations between employers and employed of an incentive to effo t, by which workmen who practise the virtues of industry and attentiveness shall meet with merited recompense, is the most effectual way of assimilating the interests of capital and labor. As he well says, when all the members of a body of workmen have something at stake in the result of their combined labor, laziness and carelessness will find no encouragement among them. The industrious men will soon see that their own income is diminished by the negligence of every slothful man among them, and united opinion will soon compel either the reform ot the shirker, or his removal. In concluding his letter, Mr. Batterson points out that, if his proposition is accepted, the workmen who enter into this new relation with the company must, like the stockholders in the company, be prepared for unprosperous, as well as prosperous, years. Against the former they are, to a certain extent, insured, by the stipulation that they shall always be paid their wages in full, whether there is any dividend from profits or not, the stockholders bearing the sole burden of actual loss; and Mr. Batterson reminds them that, if they should be disappointed in not receiving an extra sum, and should be disposed to murmur at the management of the business, they must remember that the stockholders share their disappointment equally with them. We cannot see how men, who have not given all their intelligence into the keeping of a "walking delegate," can fail to accept with joy such an arrangement as Mr. Batterson proposes. To say nothing of the increase of income which it promises, the opportunity for making their energy and ability count for something must, to men of any ambition, seem, in comparison with the present system of work under fixed tariffs of wages, like a deliverance from slavery.

ONE of the most singular occurrences that we remember in the history of the advancement of labor is reported from Stoneham, Massachusetts. In this town, which has a particularly intelligent population, are four shoe manufactories, managed on the coöperative plan. These, with some similar ones in the neighboring towns, were established about three years ago, after a bitter struggle between employers and employed in that trade, which was fostered to the utmost by a few notorious professional agitators. Enjoying from the first the favor of the community, and being managed with an ability which is usually considered to be rare among workingmen, the coöperative shops have prospered, even in these unpropitious times, and bid fair to become, if let alone, conspicuous examples of the kind of unpretending organization of industry which seems likely, before many years, to change for the better the whole social system of civilized countries. In one of these manufactories, which seems to be very similar to the rest, affairs had been, until within a few weeks, going on as smoothly as possible. The establishment was owned and operated by the persons who worked in it, about half the fifty men, and nearly all the girls employed as stitchers, holding from one to four shares of the stock, which commanded a premium of twenty per cent above the par value. The government of the company was in the hands of directors, elected by the shareholders, and the directors appointed the managers of the different departments of the shop The capital was small, only thirty thousand dollars, and business being brisk, the managers thought best to keep their money employed, reserving a cash balance large enough to pay the workmen who were not stockholders once a week, but arranging to pay the shareholders, whose interest obviously lay in allowing their money to earn the largest possible profits for them, only once a month. No one in the shop objected to this arrangement, which was evidently for the good of all concerned; but the professional "friends of the workingman," who dread nothing so much as to see their "friends" happy and prosperous, perceived in it a chance to interfere, and notified the managers of the shop, in the name of the Knights of Labor, that all the workmen must, without exception, be paid once a week. To this the managers simply replied that their stockholders, who were the only ones receiving monthly payment, preferred this, as being more advantageous to them, and that it would be impossible, at this time, to take out of the business the money necessary to pay every one once a week. The Knights then proposed that the managers should sign a pledge promising general weekly payments, assuring them that they would not be required to fulfil their promise; but the managers were honorable enough to say that they would not sign pledges that they did not intend to keep; and the Knights then ordered all the workmen to leave the shop. It seems incredible that men and women should obey such an order, but the ties of organization are very strong among operatives, while the instinct of obedience is developed in a way which renders them an easy prey to those who seek to use them for their own cruel purposes; and they abandoned at the signal not only their daily wages, but their little capital, their growing incomes, and the profitable business which they had built up by three years of patient and well-directed effort. How irreparable is the loss inflicted upon them they are as yet too inexperienced in affairs to understand. When the nod of their tyrants gives them permission to return to work, they will find their trade gone, their contracts cancelled, and their customers transferred to other establishments; their stock and machinery will be deteriorated and will need repairs, while interest on borrowed money, with the inevitable expense and waste of beginning work anew, will consume the little surplus which ought to have been earning compound interest for them in the increase of their trade. In private business a check like this might cripple a manufacturer for years, and the blow will fall severely upon the poor operatives who have yet to learn how easily the prosperity of such enterprises may be destroyed. The best that can be hoped is that the example of their misfortunes may open the eyes of the stockholders in similar corporations to the danger that threatens them from the machinations of those who care for workingmen only as slaves to their own authority, and who dread the feeling of independence and contentment which is fostered by participation in successful coöperative enterprises, as the Georgia slave drivers of the last generation dreaded the establishment of communities of free negroes near them.

FEW persons, probably, however familiar with the importance of well-built canals as channels of traffic, would suspect that the fifth port in France, in point of the tonnage of the vessels which are loaded and unloaded there, is the little basin, or rather tank, of La Villette, in the northeastern corner of Paris, which serves as the terminus for the three canals of Saint Denis, Saint Martin, and the Ourcq. The canal Saint Martin is a small, subterranean water-course, which runs under the Boulevard Richard Lenoir, from the Seine to the La Villette basin, and serves for the transportation of barges. The canal Saint Denis extends from the basin northward about ten miles, striking the Seine at a lower portion of its course; and the canal de l'Ourcq extends about fifty-five miles easterly, bringing from the little tributary river the main water-supply of Paris. As short cuts from one portion of the river to another, these canals are now of much less importance than they were before the worst obstructions to the Seine were removed, but they offer facilities for bringing heavy freight at small expense into the heart of Paris, which are becoming more and more appreciated. To compare the traffic on them with that of the railways, it is said that four years ago the amount of freight passing through the short channel which issues from the basin and afterwards divides into the two principal canals, was greater than that entering and leaving Paris by any railway, and nearly one-third as great as the traffic by all the six railways combined. The bulk of the freight consists of building-stone, rubble and plaster, firewood, flour, grain and hay, and country produce. Plaster is used profusely in building in Paris, and five hundred thousand tons are brought in every year by the canal de l'Ourcq alone. Until within a few years, all the canals were in the hands of a company which obtained from the first Napoleon, when he was particularly in need of money, a lease of them for ninety-nine years. In 1861, the city of Paris bought the unexpired term of the lease of the canal Saint Martin, and in 1876, that of the two other canals, paying for them the round sum of nearly seven million dollars, divided into about fifty annual instalments. Under the skilful management of the city officials, however, the receipts from tolls amount now to within about twenty-six thousand dollars of the annual instalments on the purchase-money, and, according to the sensible French way of reckoning, the facilities for business secured to the people of the city and suburbs bring indirectly into the public treasury much more than the apparent deficit.

THE STUYVENBERG HOSPITAL, ANTWERP.



THERE is hardly a building in Europe which has provoked as much comment, favorable and unfavorable, as the new Civic Hospital, which has recently been completed and occupied in Antwerp. Readers of the English architectural publications must have been struck with the bitterness of the discussions which took place at the Congress of the Sanitary Institute of Great Britain, recently held at Leicester, upon the presentation, by Mr. H. Saxon Snell, of a paper on "Circular Hospital Wards," the Stuyvenberg Hospital being the one specially commented upon. Mr. Snell criticized it very severely, declaring the scheme to be unduly expensive in first cost and subsequent maintenance, wasteful of space, and not easy of management. He educed many reasons which seemed to substantiate his declarations, and showed very clearly that, from his standpoint at least, the idea elaborated at Antwerp was impracticable, and not likely to be adopted elsewhere. But he was immediately followed by other gentlemen of the Congress, who were just as strongly of a contrary opinion to his own, and produced facts, plans, statistics and estimates which appeared to prove quite as conclusively that the Stuyvenberg Hospital was, in every respect, the highest and best development in its line. Now this is naturally quite confusing. When the best authorities disagree so radically, it can be permitted to lesser minds to doubt. It is not, however, the intention in the present paper to make any criticisms for, or against, but merely to state, as exactly as possible, the existing conditions and arrangements, leaving to the readers of the *American Architect* to judge of the success or failure of the scheme upon which the hospital has been built. It may be remarked in the beginning that this is the first example of a hospital constructed with isolated circular wards. Others of a similar idea have been erected in England, and the New York Cancer-Hospital, built from the plans of Mr. C. C. Haight, is provided with circular wards, though the other arrangements are quite different, and the whole is on a much smaller scale. Some of the largest hospitals in Europe have been started since the scheme for the Stuyvenberg Hospital was first made public, but in no case has there been any attempt at a departure from the old-established rectangular ward. This building, then, stands practically alone. It is hardly fair to class as an experiment, what has proved to work to the complete satisfaction of all those who are most directly concerned in it; and, whatever theorists may decide in council, the fact remains that neither the municipal nor the hospital authorities of Antwerp have expressed anything but satisfaction with the new scheme.

The Stuyvenberg Hospital is located in the extreme northern portion of the city of Antwerp. The ground devoted to it has a superficial area of 3.86 hectaires, or about nine-and-a-half acres, and is surrounded on all sides by wide streets. The general plan will show the arrangement of the various buildings. At the entrance, A, are the offices, in two stories, with receiving-rooms, the habitation of the director, wardrobes for storing the clothing of patients under treatment, etc. Clothing is provided for the patients while they are in the hospital, their own being thoroughly cleansed, and restored to them on their discharge. Beyond the administration-building is the chapel, C. The building at D, beyond this, is occupied by the kitchen and dependencies at the front, and the pharmacy and chemical laboratories at the rear. At E is the building occupied by the nurses — in this case, Sisters of Charity. The second story of the same building is used for storage of linen. At F are the baths, including ordinary hot-water baths, as well as appliances for medicated, vapor, Russian and Turkish baths. The building in the rear, at G, entirely isolated from the rest, is occupied by the steam laundry and drying-rooms, the engines and steam-pumps being likewise installed at one side and the boiler-rooms occupying the cellar. The small pavilion on the left, near the front, at B, is devoted to operations and clinics. The corresponding building on the opposite side, H, is the morgue. The eight buildings, marked *a*, are the hospital-wards, which will be described farther on. At *b*, on either side of the entrance to these wards, are small rooms for isolating patients who may be suffering with an especially dangerous or contagious disease. There are twenty-four such wards in all. Opposite these are the rooms for service, and the stairs leading to the second story. At P, near the baths, are separate wards in two stories, designed for such patients as care to pay for being by themselves. There are twenty-four of these rooms. The refectories are on either side of the building, D.

These buildings are connected by lines of corridors, as shown by the general plan, which are enclosed by sashes in the first story, and consist simply of an open walk above. Besides this there is connection, by means of underground passages starting from the rear at the laundry, passing beneath the bath-house, and thence following the lines of corridors, connecting directly with the cellar under each building. This passage is used for transporting the dead from the wards to the morgue, and for removing soiled linen, sweepings, etc., steam and water pipes being also run in this passage.

The hospital is built throughout of brick and iron, with stone finish. There is, of course, no chance for any architectural magnificence, but the design is neat throughout, and the appearance is certainly very pleasing. The floors of the passages are of concrete mosaic. The stairs and the flooring in the wards are of wood, but the construction is everywhere of iron beams, with brick arches. It is hardly necessary to go any further into details, but a visitor to the hospital cannot but notice the extreme, wax-like neatness which prevails everywhere. The cooking in the kitchen is done almost entirely by steam, and everything about it is so clean and tidy, one could feel sure that the food prepared by the white-capped sisters would be wholesome and appetizing. There are no dark corners anywhere, or obscure passages. Everything is bright and cheerful; and, while much of this is doubtless due to the newness of the building, a great deal must also be credited to the care and taste evinced in plan and design. In fact, the most exacting critic would see little to find fault with in the hospital, as thus far described. The objection is to the circular wards, which are, indeed, the only departure from the commonly-accepted hospital plan.

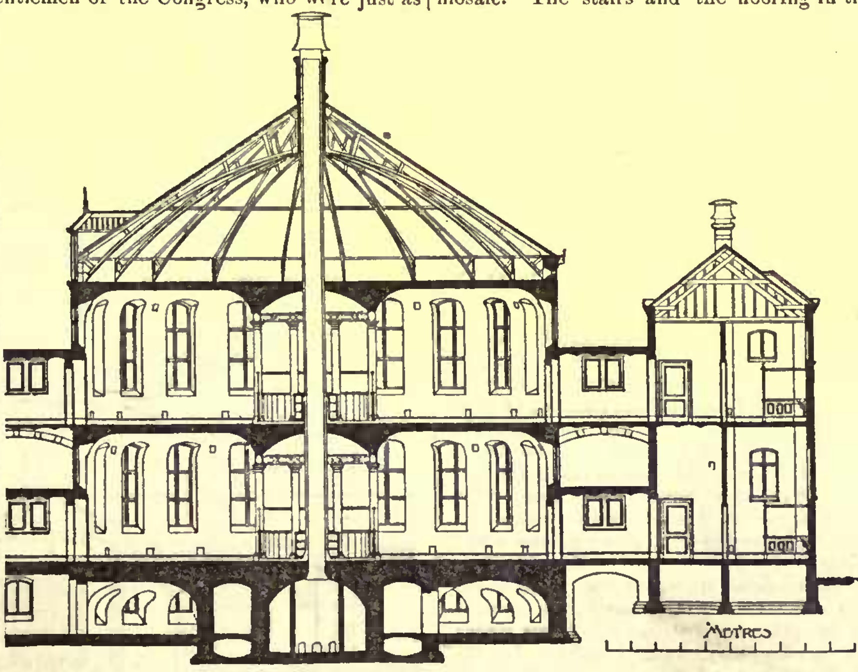


Fig. 2. Section of Circular Ward.

A section and plan of one of the wards are given herewith. It will be seen that the wards are completely isolated from the other buildings, except by the short, low, connecting passages. Each ward is arranged for twenty beds, disposed around the wall, with one large window for each bed. The wards are nearly sixty-two feet in diameter, and seventeen feet and-a-half in clear height, thus allowing

approximately 2,600 cubic feet of space per bed. The writer is not able to say whether this excessive allowance per bed is a result of the circular-ward system, or is due to deliberate intent on the part of the planners. If, however, the height of the ward were reduced to eleven feet, there would be but 1,660 cubic feet per bed, which is no more than a fair allowance for a public hospital; hence, it is fair to assume that a circular ward does not necessarily imply an overabundance of space. Each bed has a wall-space of about ten feet in length, the beds being eight and-a-quarter feet on centres at the foot.

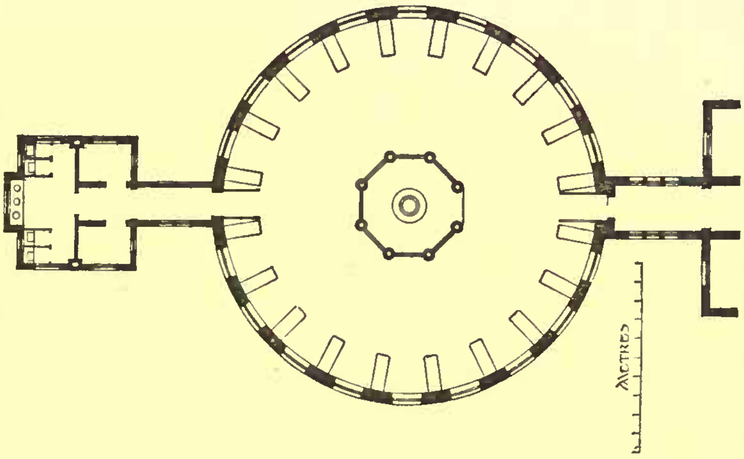


Fig. 3. Plan of Circular Ward.

The walls and ceilings of the wards are plastered and left plain white. The ceiling and wall are rounded together, so that there shall be no angles to interfere with the action of the ventilation. In the centre of the ward is a space about fifteen feet in diameter, surrounded by the iron columns supporting the ceiling, and enclosed by a glass screen. This is for the nurse in charge of the ward. At the centre is the ventilating-shaft, against which are built some chests for linen, etc. The loft in the roof is used only for storage, and has no connection with the wards, being reached by an external gallery not shown on the section. At the rear of each ward is a small pavilion, containing in each story a room for the service, a bath-room, and a series of water-closets, with wash-basins and a sink.

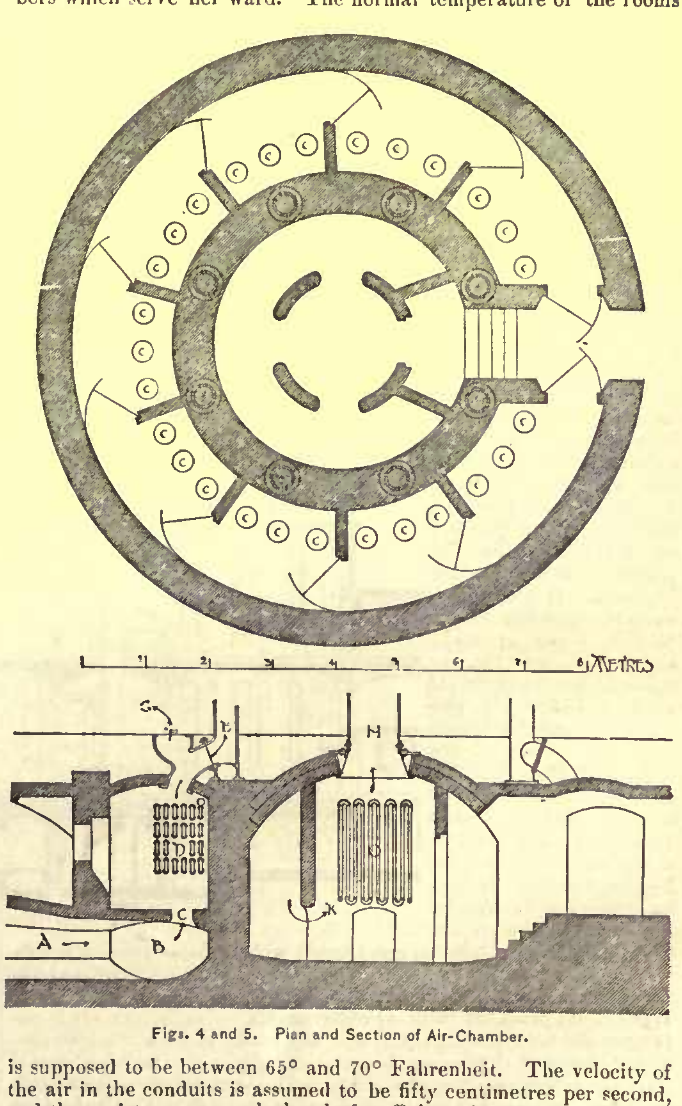
Antwerp is so poorly supplied with sewers, in this quarter at least, that the hospital is obliged to depend upon cesspools, except for the waste from the baths, wash-bowls, etc., which is allowed to flow into the street-gutters. There are four large cesspools, located between the wards on the line of the side-streets, at *K* of the general plan. They are emptied from the street without entering the hospital-grounds, and are sufficiently removed from the wards to obviate any unpleasantness.

It may be of interest to note some of the reasons which influenced the architects of the hospital in recommending and studying out the system of circular wards, as stated by them to the writer in a recent interview. Their attention was first directed to the matter by noticing that patients in hospitals invariably objected to being placed in the angles of a rectangular ward, and the nurses never filled the corner beds until the rest were all occupied. In some cases there was too much ventilation; in others the air was stagnant; but always the objection existed. Again, it seemed fair to suppose that in winter the cold air would drive with more force into the windows of a rectangular ward than into the few windows of a circular ward which would be directly opposed to the wind; while in all seasons and in any location the sun would enter more freely, and for a longer time with the latter plan. And as in this instance there was no intention of depending upon the windows for ventilation, it was no objection to have the opposite windows farther apart than they would be in a rectangular ward. Besides, a circular ward allowed of a better control over the patients, the nurse being in a position to see everything without changing her place. The readers of the *American Architect* who have followed the lengthy discussions which have appeared in the British papers can judge for themselves of the absolute value of these arguments. As to appearance, the Stuyvenberg Hospital leaves little to be desired either within or without, and it would be difficult to find anywhere pleasanter hospital wards than those under consideration.

The arrangements for heating and ventilating so extensive a series of buildings as this must naturally be of considerable magnitude. Indeed when it is remembered that while the entire cost of building the hospital was 2,600,000 francs, 350,000 francs of that amount, or over thirteen per cent was expended simply for works and appliances in connection with the heating and ventilation, it will readily be understood that nothing was neglected which could tend to make the system perfect in all its functions. With an existence of less than a year, it is now too early to say how successful it will prove in operation; but so far as intelligent forethought and careful planning can make anything a success, this surely seems to be perfect. Complications and cumbersome details of management appear to have been studiously avoided, and provisions are made for the atmospheric changes which at times are so apt to quite reverse the conditions under which the air in a room can be effectually changed without discomfort to the occupants. Still the system is kept essentially simple in all its operations.

There are two intakes for fresh air, one on either side of the boiler and laundry house, at L, of the general plan. Each intake consists of a brick shaft extended perhaps ten feet above the ground, and protected by a wooden hood. There are no provisions of any description for purifying, moistening or cooling the air. The intakes connect with underground passages about six-and-a-half feet high, and five feet wide. The course of these is indicated on the general plan by the lines M. At the point nearest the boiler-house in each passage is a helicoid fan for forcing the current. Each fan is capable of moving over six hundred cubic metres of air per minute if desired, motive force being supplied by steam-engines in the adjoining house; three hundred cubic metres per minute is, however, generally quite sufficient, and in some kinds of weather the help of the fan is dispensed with altogether, as hereafter described.

The arrangement of flues, etc., being identical in all the wards, the description will be confined to one. The section and plan of a portion of the cellar given herewith, (Fig. 4), will make the disposition clear. The incoming fresh air enters at A, and passes into the annular chamber B, thence rising through the holes in the floor at C, into a series of chambers separated from each other by iron doors, where are arranged stacks of steam-pipes, as at D of the section. Half of these chambers serve the first-story ward, and the rest are for the upper story. The section is taken through one of the first-story chambers. The heated air rises thence in the direction of the arrow E, ascending through the hollow-iron columns about the centre of the ward, which are connected at the top by a box-girder with open-work sides: the hot air enters this, and thence escapes freely into the ward, the supply being regulated by valves placed where the girder joins the columns. But if for any reason it is thought undesirable to admit the warm air at the top of the ward, then the upper valves are closed, a floor register at F is opened, and the hot air escapes into the room in the direction of the arrow G. For the second-story ward the arrangements are exactly the same, except that of course the hot air must ascend through the lower-story columns before either escaping through the floor registers, or rising to the open girder. Besides this there are levers rising from the cellar, with the aid of which the nurse on either floor can cut off the supply of steam from the chambers which serve her ward. The normal temperature of the rooms



Figs. 4 and 5. Plan and Section of Air-Chamber.

is supposed to be between 65° and 70° Fahrenheit. The velocity of the air in the conduits is assumed to be fifty centimetres per second, and the registers were calculated of sufficient size to give with this velocity a supply of one hundred cubic metres per bed per hour. By

increasing the speed of the ventilating fans, and admitting more steam to the heating-chambers, the supply can be raised to two hundred cubic metres per bed per hour, as has been actually ascertained by tests made with anemometers.

In case the ventilating-fans are not required to force the draught of fresh air, a valve is closed in the conduit A, Figure 4, and the air is drawn from an area immediately outside of the cellar wall.

For the evacuation of the vitiated air there are four sets of registers and flues. First, there are twenty 10″ x 12″ registers, one beside each bed at the bottom of the wall. These are for use in case the warm air is admitted to the ward at the top, and their action is supplemented by eight 5″ x 9″ registers in the risers of the raised floor at the centre of the ward. Then there are ten 10″ x12″ registers in the outside wall near the ceiling, and eight similar registers in the outer cove over the central columns, which are opened when the warm air is admitted to the ward from below. The location of these registers is indicated in the section, Figure 2. The outer registers connect with flues in the wall through which the air from the wards is led down to the lower floor, and thence across in the thickness of the floor to the central portion of the cellar (see Fig. 6). The air follows the direction of the arrows, K, entering the central well or chamber, in which is a large coil of steam-pipe, O, which heats the air, causing it to ascend through the ventilating-chimney H. The letters refer to either Figures 4, 5 or 6. The ventilating-chimney extends without a break to above the peak of the roof. It is constructed of wrought-iron, supported directly on the cellar vaulting, as shown by Figure 5, and is composed of two shells separated by a space of four inches. The registers in the wards above and below the columns all lead to the space between the shells of the flue, the draught therein being aided only by the heat which ascends through the centre.

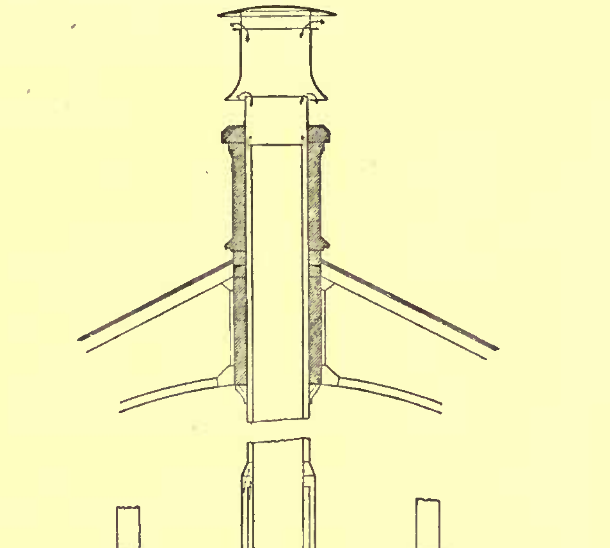


Fig. 6. The Exhaust Ventilator and Flues.

It will be noticed that while the system of ventilation is artificial throughout, all possible advantage is taken of natural circumstances to aid the draught, the warm air rising in the centre of the ward where it cannot be disturbed by cold air from the windows, and the vitiated air passing into flues in the outer wall where contact with the cold masonry would help the downward current; while the high central chimney alone would be found to exercise a powerful suction. Indeed, thus far it has proved that the aid of the steam coils at O are seldom necessary in order to properly change the air in the rooms. All of the windows are high, and are provided with movable transoms, and in summer a through ventilation can easily be had across the ward, no matter in which direction the wind may be blowing, without causing an undue draught to be felt by the patients.

The ventilating-chimney has a total height of nearly eighty feet. Above the roof it is cased with brick, and is capped with an iron cowl constructed as indicated by Figure 5, designed especially to prevent any downward draughts.

The heating and ventilating of the wards for single patients offers nothing of special interest, being simply on the indirect system in use in the United States, with top and bottom inlet and outlet flues to be used as desired. The water-closets are ventilated in the same manner.

The architects of the hospital are J. Bilmeyer and J. Van Riel, of Antwerp. The heating and ventilating arrangements were planned entirely by them, and they claim the honor of being the first to make plans for a hospital with circular wards, having prepared a scheme on this basis several years before the Stuyvenberg Hospital was begun.

C. H. BLACKALL.

JAPANESE HOMES AND THEIR SURROUNDINGS.[1]—IV.

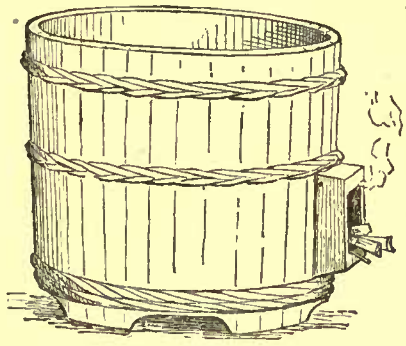


Fig. 1.

WE give below a final extract from Professor Morse's book, and in doing so we desire to point out that though we have subjected the work to pillage we have, in the interest of the author and his publishers, carefully abstained from making excerpts from those portions of the book which treat so fully of architectural and constructive features. It has not been our intention to diminish the author's profits by presenting to a professional audience, amongst whom he ought to find his most numerous readers, the very kernel of the nut. We have but cracked the shell and disclosed here and there, in the social and ethnological extracts we have made, the possible flavor of the meat that lies within. The illustrations we have used are but a fair samples of the three hundred-odd which the book contains.

There is no feature of social life in Japan which has been more ignorantly, and in some cases wilfully, animadverted upon than the custom of public bathing; nevertheless, I dare to say that there is no feature in Japanese life to be more heartily commended than this same system of public bathing. But by this assertion I do not mean to suggest that we shall forthwith proceed to establish baths after the Japanese style, and take them after the Japanese fashion. The Japanese, as well as other Eastern people, have for centuries been accustomed to see nakedness without its provoking among them the slightest attention, or in any way suggesting immodesty. With us, on the contrary, the effect has been different; and the dire result is seen in the almost utter extinction in our country of the classical drama, and the substitution therefor of ballet-dancing and burlesques —of anything in fact that shall present to the vulgar gaze of thousands the female form in scanty apparel.[2] A Turkish woman looks upon her Christian sister as not only immodest and vulgar, but absolutely immoral, because she unblushingly parades the public street with a naked face; but the Christian woman knows that the established customs of her country sanction such an exposure as entirely proper. A girl who in our country would deem it immodest to appear among the members of her own family in a *robe de chambre*, and yet under the glare of a bright gas-light, in the midst of scores of strangers, appears with low *corsage*, is committing an act which to a Turkish woman would appear inexplicable. To a Japanese, the sight of our dazzling ball-rooms, with girls in *décolleté* dresses, clasped in the arms of their partners and whirling to the sound of exciting music, must seem the wildest debauch imaginable; for in Japan the sexes, except among the lowest classes, never intermingle. No free and happy picnics, sleigh-rides, boat-sails, and evening parties among

[1] "*Japanese Homes and their Surroundings*," by Edward S. Morse, late Professor of Zoology, University of Tokio, Japan; with Illustrations by the Author. Ticknor & Co. 1886. Price, $5.00. Continued from No. 526, Page 42.

[2] A correspondent in the *Pall Mall Gazette*, in protesting against the attempt to impose European clothing on these people who are accustomed to go without any, says: "In many parts of India there is a profound suspicion of the irreligiousness of clothing. The fakir is distressed even by the regulation rag upon which the Government modestly insists, and a fully-dressed fakir would be scouted. The late Brahmo minister, Chesuh Chunder Sen, expressed the belief that India would never accept a Christ in hat and boots. The missionary should remember that clothes-morality is climatic, and that if a certain degree of covering of the body has gradually become in the Northwest associated with morality and piety, the traditions of tropical countries may have equally connected elaborate dress rather with the sensualities of Solomon in his glory than with the purity of the lily as clothed by Nature."

the girls and boys are known there; no hand-shake, no friendly kiss. If the Japanese visitor in this country is a narrow-minded and witless scribbler, he will probably startle his friends at home with accounts of the grossly immoral character of Christians. Unfamiliar as he is with the corner-loafer eyeing every girl that walks by, or with that class which throng our walks with the sole purpose of staring at the girls, who are there for the purpose of being stared at, what must he think of our people when he visits our summer resorts at the seaside and sees a young girl — nay, swarms of them — tripping over the sand under a bright sun, bare-legged, clad only in a single wrapper, which when wet clings to her form, and renders her an object of contemplation to a battalion of young men who fringe the beach!

In Japan, among the lower classes, the sexes bathe together, but with a modesty and propriety that are inconceivable to a foreigner until he has witnessed it. Though naked, there is no indecent exposure of the person. While in the bath they are absorbed in their work, and though chatting and laughing seem utterly unmindful of each other. The grossest libels have been written about the Japanese in reference to their custom of public bathing; and I hazard the statement, without fear of contradiction, that an intelligent Japanese, seeing many of our customs for the first time, without knowing the conditions under which they had grown up, would find infinitely more to condemn as immodest, than an intelligent foreigner would find in seeing for the first time certain Japanese customs, with the same ignorance at the outset as to what such customs implied.

If cleanliness is next to godliness, than verily the Japanese are a godly race.[1] The simple statement, without qualification, that numbers of Japanese in their public baths bathe in the same water would seem a filthy habit. Certainly if such a statement were really true in regard to our own lower classes, it would be a most filthy habit. When it is understood, however, that the Japanese working classes — such as the carpenters, masons and others — often bathe two or three times a day, and must of necessity enter the bath in a state of cleanliness such as our workmen rarely if ever attain, the statement loses some of its force. When it is further added that these people do not wash in the baths, but boil or soak in them for a while, and then upon a platform, with an extra bucket of water and a towel, wash and dry themselves, the filthy character of this performance assumes quite another aspect. A Japanese, familiar with his airy and barn-like theatres, his public readings under an open tent-like structure, or gatherings in a room in which one or all sides may be open to the air even in mid-winter, would look upon the usual public gatherings of our people in lecture-halls, school-rooms, and other closed apartments, wherein the air often becomes so foul that people faint and struggle to the door to get a breath of fresh air, — a Japanese, I say, would justly look upon such practices as filthy to the last degree. And what *would* he say to one of our great political meetings, for example, where a vast unwashed herd of perspiring and excited people actually bathe the irdelicate membraneous lungs in the combined breath of hundreds!

The public baths, however, do not concern us,—though it may be well to contrast our country with Japan in this respect, where in the latter country every village and every town, and in the city nearly every square, possesses public baths where for the price of a cent or two one may find conveniences for a hot bath; while in our country public baths are only found in the larger cities, and few of these even can boast of such a luxury. As for the private houses in our country where bathing is customary, an inquiry shows that few possess the convenience of a bath-tub. Among the masses of our people a Saturday-night wash may or may not be enforced; when it is, this performance usually takes place in the kitchen, with hot water furnished from the kettle. But in Japan nearly every house among the higher and middle classes possesses the most ample arrangements for hot baths; and even among the poorer classes, in the country as well as in the city, this convenience is not wanting, with the added convenience of public baths everywhere attainable if desired.

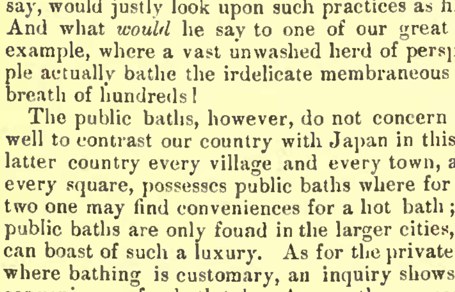


Fig. 2.

There are many forms of bathing-tubs, all of them being large and deep. Means for applying the heat direct, which is of course the most economical, is attained in various ways. In the common form (Fig. 1), a small chamber of copper is introduced at one end near the bottom of the tub,—the mouth having a frame of stone, or of clay or plaster. In this chamber a fire is built, and the water can be brought, if necessary, to the boiling point. Within the tub a few transverse bars prevent the bather from coming in contact with the hot chamber in which the fire is burning. In another form, a copper funnel or tube passes directly through the bottom of the bathing-tub. The bottom of this tube has a grating of wire; charcoal is then placed in the tube, and its combustion rapidly heats the water. A pan is placed below the tube to catch the coal and ashes that fall through. In a more elaborate form (Fig. 2), the bath-tub is in two sections, separated by the partition of the room. These two sections are connected by a number of bamboo tubes or flues, so that the water may circulate freely. The section outside contains the fire-box, in which the fire is built; by this arrangement the bather escapes the discomfort of the smoke from the fire.

While in a Japanese house, as we have seen, the most ample conveniences exist for taking a hot or cold bath, the minor conveniences for washing the face and hands are not always so apparent. In such attempts one is more often reminded of a primitive country-house at home, where one either goes down to the kitchen, and amid a clutter of pails and pans manages to wash himself, or else takes a tin basin and goes out to the well,—and this on a fresh cool morning is by far the more agreeable. In the country a Japanese may be seen in the yard or by the roadside washing his face in a bucket or shallow tub; and at inns, and even in private houses, one is given a copper basin, and a bucket of water being brought he uses a portion of the veranda as a wash-stand.

[1] Rein says: "The cleanliness of the Japanese is one of his most commendable qualities. It is apparent in his body, in his house, in his workshop, and no less in the great carefulness and exemplary exactness with which he looks after his fields."

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

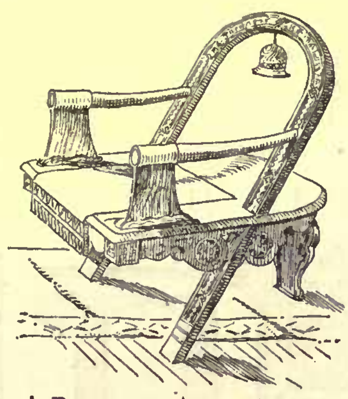
PUBLIC SCHOOL LIBRARY, DAYTON, OHIO. MESSRS. PETERS & BURNS, ARCHITECTS, DAYTON, O.

THIS building is being erected in an open square, well grown up with forest trees, and used as a park. It is the intention to make it practically fireproof, hollow tile and iron beam construction being used throughout. The exterior walls are laid up of local blue-gray limestone, laid as broken ashlar work, and freely trimmed with a warm, rich, red sandstone from Marquette, Michigan. The roof is to be covered with heavy red slates. Tile floors are to be used throughout the halls, vestibules, and lobby — hard wood in the remainder. Exclusive of the tile floors and gas-fixtures, the building is under contract for $83,000, and is expected to be completed about January, 1887.

OLD COLONIAL WORK NOS. I. AND II. THE PARLOR OF THE NICHOLS HOUSE, SALEM, MASS. DRAWN AND MEASURED BY MR. F. E. WALLIS.

COMPETITIVE DESIGN FOR THE COURT-HOUSE, TORONTO, CANADA. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

BEHAVIOR OF CEMENT-MORTARS UNDER VARIOUS CONTINGENCIES OF USE.[1]



A Russian. Arm-Chair. Antwerp. Exhibition. Belgm

IN reference to changes in dimension of cement-mortars during setting, Mr. Clarke, in his valuable paper recently published,[2] shows quite clearly that there is an expansion. On the contrary, our past President, Mr. Whittemore, in a recent letter to me, states his experience with a cylinder filled fifty feet with concrete. The latter contracted two inches without any superposed weight.

Experiments on cements at the East River Bridge (see *Transactions* for September, 1878), show a depression in strength of briquettes at the end of seven days. The query then would be: Is there a preliminary expansion due to crystallization, and a subsequent contraction, or has the amount of water used something to do with it?

His conclusion, on page 155, that salt water, either for immersion or mixing, has no important effect, would seem to require modification for the case of Portland cement mixed one to two with fresh water and immersed in salt water. The strengths given are but seventy to ninety per cent of those immersed in fresh water.

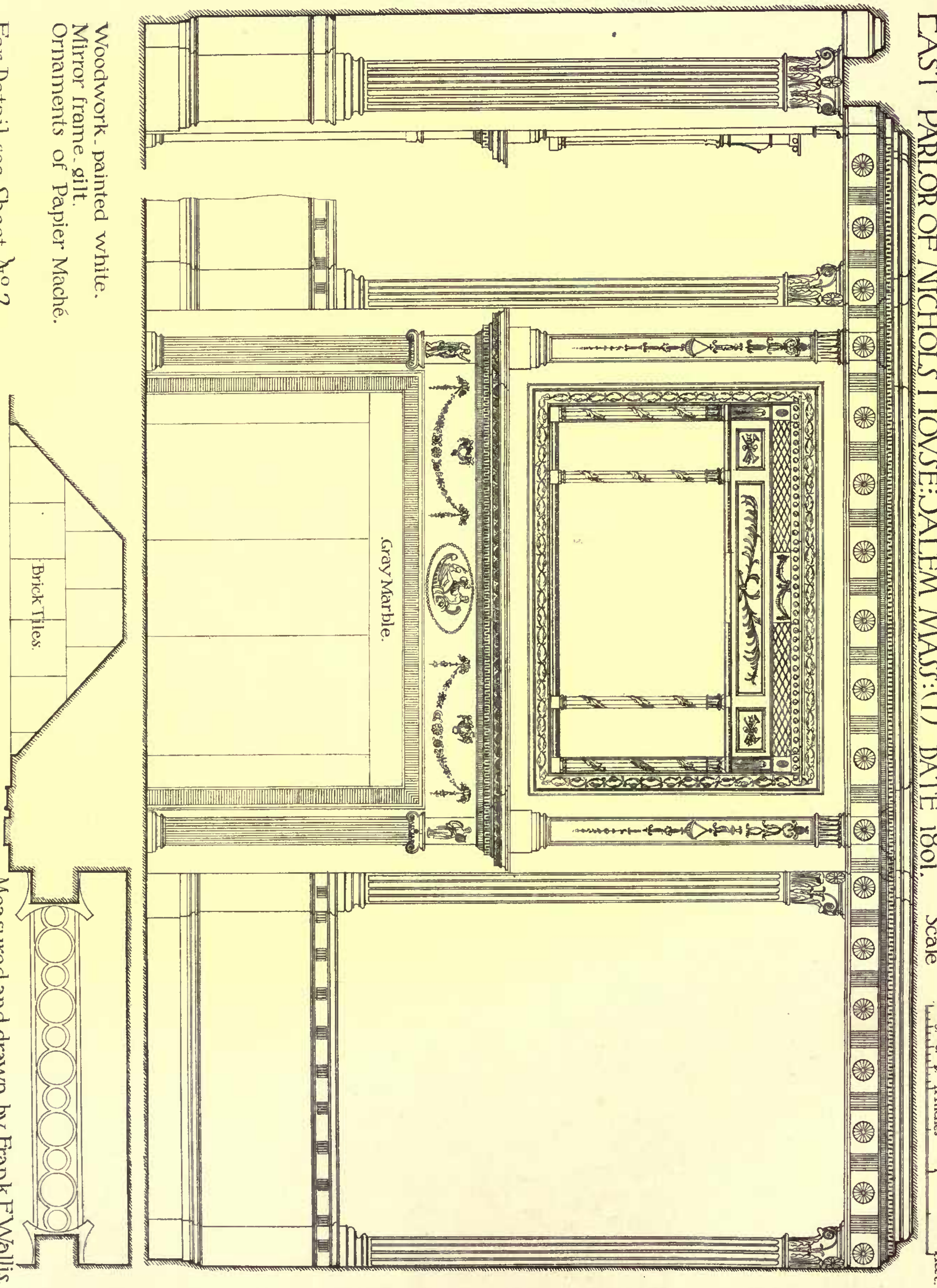
A friend recently informed the writer that a certain natural cement, which gave excellent results when mixed with fresh water, was

[1] From a paper by F. Collingwood, M. Am. Soc. C. E., read November 4, 1885, and published in the *Transactions* of the Society.

[2] Record of Tests of Cement made for Boston Main Drainage Works, 1878–84, by Eliot C. Clarke, M. Am. Soc. C. E. *Transactions*, No. 300, Vol. XIV., April, 1885, page 141.

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EAST PARLOR OF "NICHOLS HOUSE": SALEM MASS: (1) DATE 1801. Scale



Woodwork, painted white.
Mirror frame, gilt.
Ornaments of Papier Maché.
For Detail see Sheet No. 2.

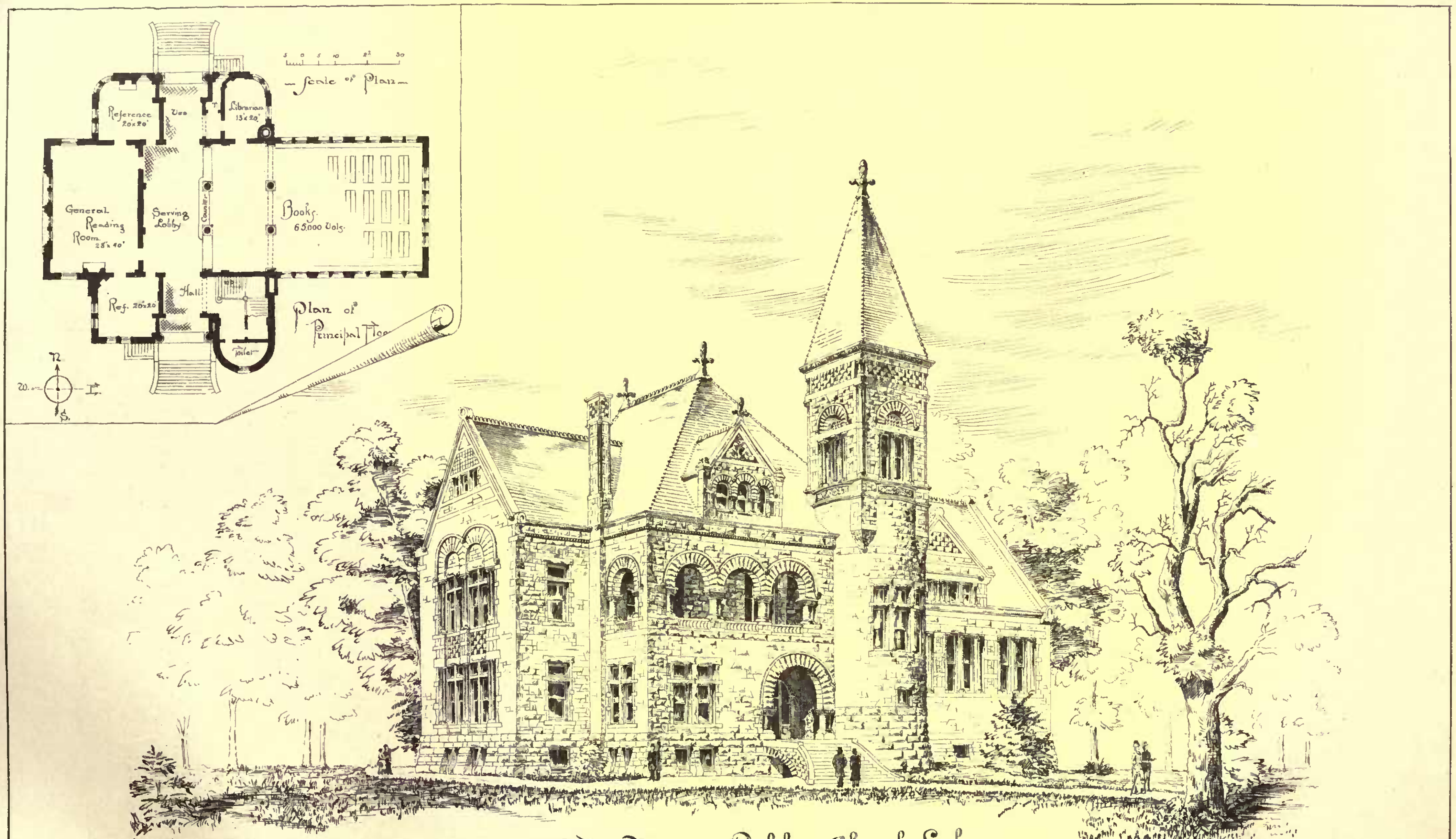
Measured and drawn by Frank E. Wallis.

OLD COLONIAL WORK, I.

HELIOTYPE PRINTING CO. BOSTON

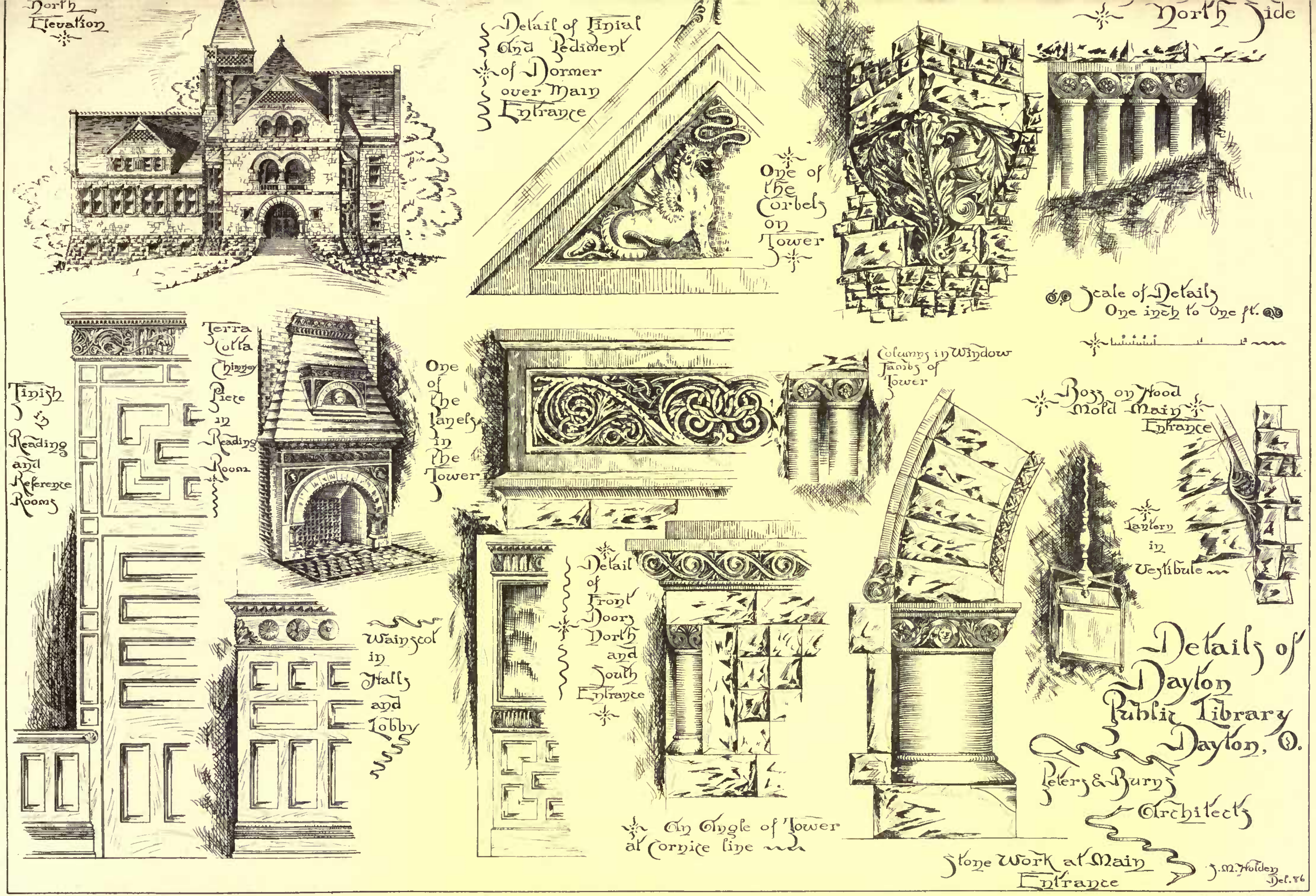
American Architect and Building News, Feb. 6 1886.

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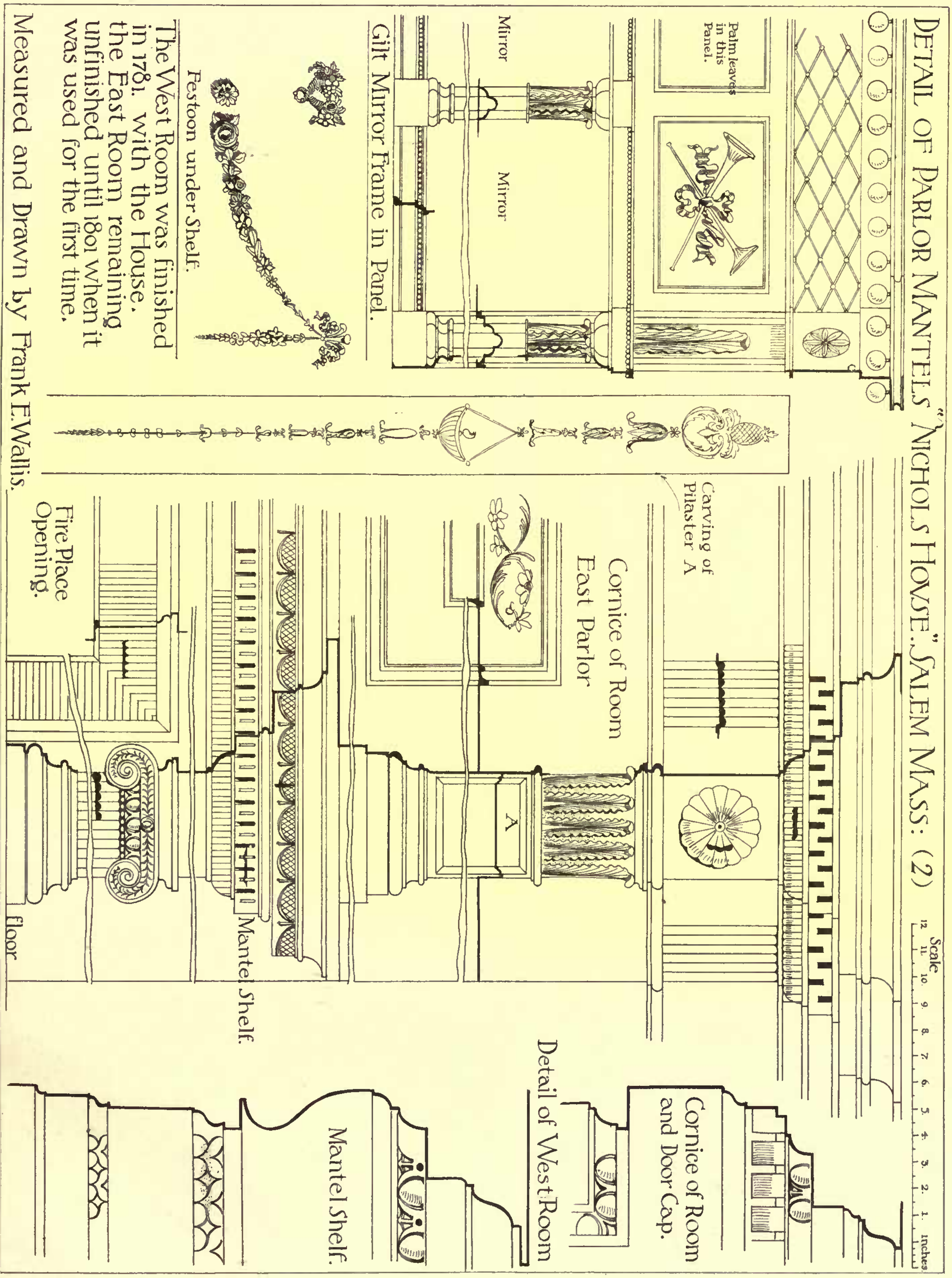
The Dayton Public School Library.

Peters & Burns, Architects, Dayton. O.



HELIOTYPE PRINTING CO. BOSTON

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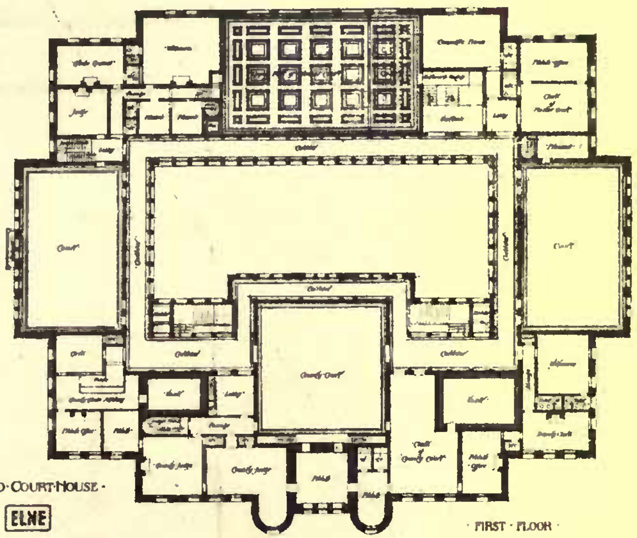


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COMPETITIVE DESIGN FOR THE

· TORONTO · COURT · HOUSE ·

MESSRS. CHAMBERLIN & WHIDDEN,
: ARCHITECTS :

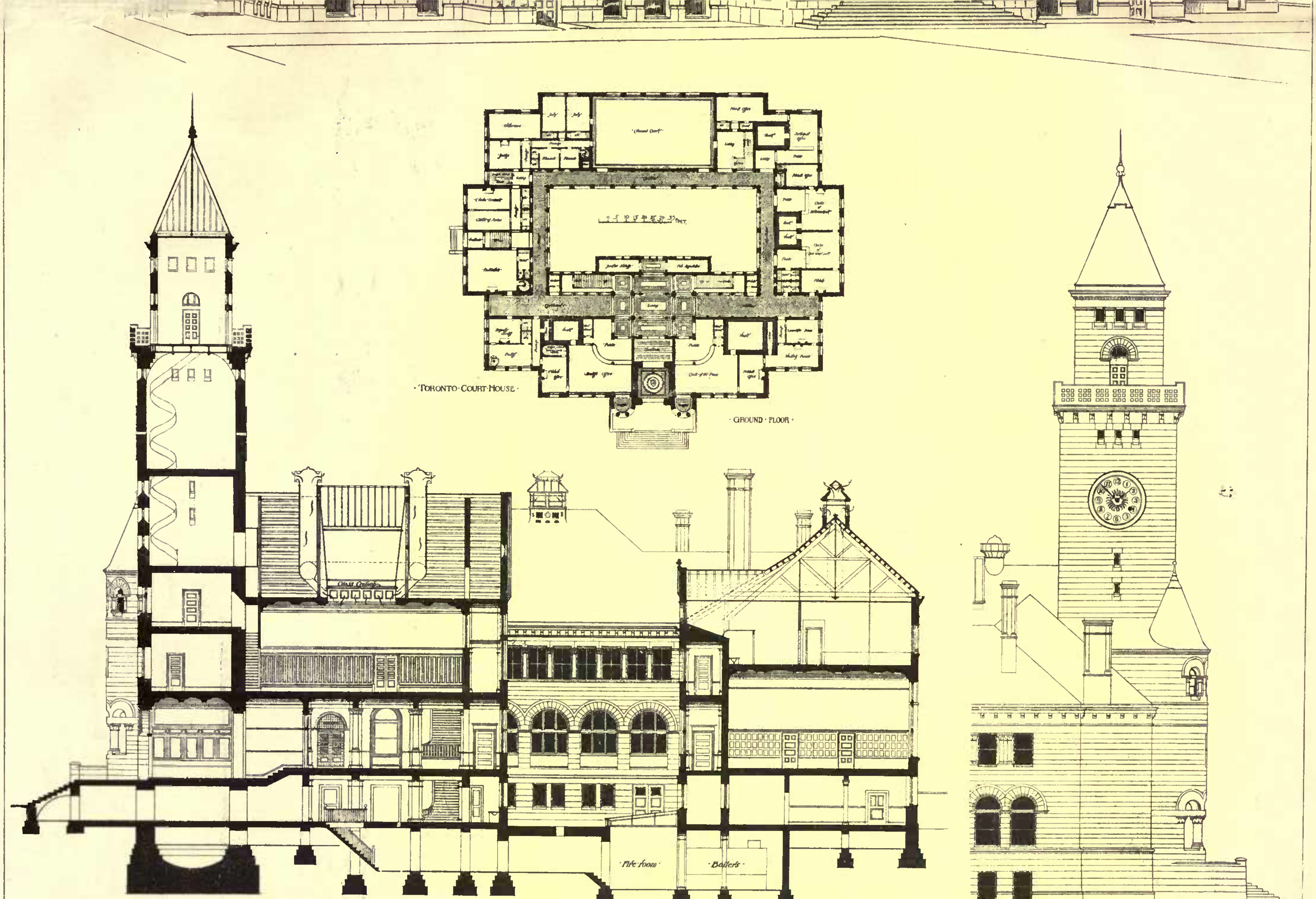


· TORONTO · COURT · HOUSE ·

· FIRST · FLOOR ·

ELNE





· Toronto · Court · House ·

· Ground · Floor ·

· TRANSVERSE : SECTION ·

Heliotype Printing Co Boston

inferior to others when mixed with salt water. Details of the test are wanting; but if the statement is correct, it shows that such tests should be made where salt water is to be used with an untried cement. . . . .

As to retempered mortar, it certainly has a greater tendency to crack than that freshly mixed, and does not do well for pointing. Further experiments are desirable.

Referring again to the question of change of dimension in setting, there is no doubt that some of the cases of warping of walls are due to placing the weight of floors on walls too soon. A side wall of a five-story building, which was honestly built in brick with good cement-mortar, came under the writer's observation. It was drawn inwards in this manner so as to be decidedly concave; the versed sine of the curve being several inches. The floors were heavily loaded, and were supported on the walls as soon as the masonry was high enough for the purpose.

In these days of rapid building, the questions here raised may often be of great importance, if we are to be assured that our work shall be free from cracks and unequal settlements.

The matter of changes in dimensions of masonry by change of temperature has been accurately experimented upon by M. Bouniceau, and from the *Annales des Ponts et Chaussees* for 1863, the following summary of results has been taken as a matter of interest in this connection.

The methods pursued were very exact, and tests were made on ten different substances and mixtures.

The coefficients of dilation obtained were as follows; they are the percentage of expansion for one degree Centigrade, carried to the ten-millionth place of decimals: —

No. 1.	Portland cement, pure, properly gauged and having set under water	0.000,010,7
No. 2.	Portland cement-mortar, containing one volume cement and two volumes silicious sand, as ordinarily used in hydraulic work	0.000,011,8
No. 3.	Brick masonry, of sandy bricks from Havre or D'Honfleur, and of mortar No. 2, the bricks being placed edgewise	0.000,008,9
No. 4.	The same as last, with bricks placed lengthwise .	0.000,004,6
No. 5.	Béton, composed of the same mortar, No. 2, and of round silicious pebbles (the proportion of pebbles not given)	0.000,014,3
No. 6.	Dressed limestone from Ranville	0.000,007,5
No. 7.	" " " Maladrerie	0.000,008,9
No. 8.	" granite " Dielette	0.000,007,9
No. 9.	" marble	0.000,005,4
No. 10.	Cast plaster-of-Paris	0.000,016,6

"These coefficients, which seem infinitely small, produce, however, very apparent effects (although not always hurtful) to work of large dimensions.

"Suppose a monolithic wall one thousand metres long, in béton, between abutments supposed immovable, to undergo a change of temperature from + 20° Centigrade to — 10° Centigrade. This change of 30° will cause a diminution of forty centimetres in length. If the fissures caused by this change be filled with hard cement, or if, according to observations by Mr. Herve Mangon, they become filled, after a time, with detritus, the wall, when forced on the return of warm weather to lengthen itself forty centimetres, will be bent fourteen to fifteen metres from a straight line. These things do not come to pass because the walls are not monolithic, and are composed of a considerable quantity of small sedimentary materials joined together imperfectly by cement. It is not rare, however, to see long closed walls (as of reservoirs) bulging outward, and sometimes falling without known cause.

"It is therefore well to leave in the lengths of walls between rigid abutments, or of quays in the open air, like those of Paris, spaces of some centimetres or millimetres at certain distances.

"Mr. Mary, Inspector-General of Roads and Bridges, has informed us of a reservoir which, having been constructed in fine weather, became in the winter fissured by contraction, and lost its water, but became tight again on the return of spring.

"Passing to the general discussion of the experiments, we go on to notice that the expansion of béton masonry is much greater than that of brick masonry, being one and one-half times that of bricks on edge, and three times that of bricks lengthwise, showing clearly that the mortar in the brick masonry expands more than the brick itself. The ratio can be established by comparing the relative lengths of brick and of mortar.

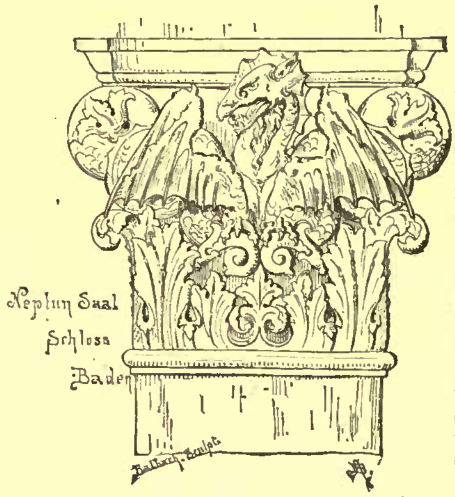
"Plaster-of-Paris expands most of all.

"The expansion of marble is very small, and this may be the explanation of the preservation of surfaces of this material."

As bearing upon the subject of compression, the Secretary has handed the writer a short paper, furnished by the architect, Mr. George B. Post, respecting the Produce Exchange Building, in which Mr. Post says: "The tower, which is two hundred and forty feet high from the foundation, has its southerly wall, for a height of one hundred and twenty feet, carried by iron columns, while the remaining walls are built of masonry. It was built with great care, and I have as yet been unable to find any crack at the point where the rigid iron construction connects with the brickwork. About a year ago I was led to the conclusion that there was a very important element of weakness in many of our buildings which was not always considered, viz., in the shrinkage of cement-mortars. I found in my practice that where iron mullions were built between brick jambs, the jambs decreased in length to such an extent that it was very appreciable, and very frequently cracked the stone lintels above them.

"I have since made some experiments, and find that in a distance of nine feet six inches, with a load of sixty-two pounds to the square inch on the brickwork, the diminution of length in piers was from three-eighths of an inch to half an inch. The experiments were made by building steel blocks into the walls of the Cotton Exchange, which I am now constructing, and measuring the distance between them with a steel tape, at a temperature of fifty-two degrees. Within the last few weeks the measures were again taken with the same tape, and at the same temperature. In the Produce Exchange Building I have avoided the evil consequences of shrinkage of the walls by the expedient of making slip-joints in all vertical ironwork used in the windows of the outside of the building, so that if shrinkage takes place, or compression, no weight can possibly be thrown on the mullion, and cracks must be impossible."

BUILDING MATERIALS AND FROST.



IN view of the approaching winter it will not be out of place if we direct our readers' attention to this subject, which, says our contemporary, the *Builder*, has from time to time engaged the careful attention of scientific men, and amongst others Brard, Braun, and Tetmajer have published in various Continental journals (as well as special treatises) the results of their detailed investigations. Brard's test consists in the saturation of the material to be tested with a solution of glauber or other salt of a given strength, and in then permitting the expulsion of the salt by crystallization, it being supposed that the salt would produce an effect similar to that of the congelation of water. Braun institutes a comparison between the strength of extension of the material and the force of the solidifying water, assuming that a material is not capable of resisting frost when the former is less than the latter. Tetmajer employs a number expressing the proportion between the resistance to pressure in a dry and in a wet state. In addition to the above, Hampel's test with muriatic acid deserves mention.

In reviewing these processes, Herr A. Blümcke points out in the *Thonindustrie Zeitung* that all of them subject the material to conditions which are not to be found in practice, while their more or less complicated nature forms an obstacle to their adoption. On the other hand the process of Bauschinger is more practical, consisting in the exposure of the material twenty-five times to frost in the open air, the strength before and after the test serving as a guide to the resisting power. The production by artificial means of the needful degree of cold suggests itself, but hitherto this process has only been accomplished by the aid of chemicals, which affect the substances treated in such a way as to prevent the ready appreciation of the effects produced by frost. Hence a proposal of Hericat de Thury has been carefully studied by Herr Blümcke, with the result of his perfecting the following method: —

The stones to be tested are placed two at a time in a wire framework suspended from a rod. These are placed in a cylindrical metal vessel sloped off at the foot in funnel form and with a cover. This is enclosed in a larger vessel of the same shape, and held in position by supports. There is a space of two inches around the smaller vessel, which space is filled with a refrigerating mixture. A vessel two inches in height is also placed above, which is filled with the same mixture. At one time an escape-pipe has been in use at the lower part of the apparatus, but it was found more practicable to empty it after each operation by a syphon. The cold mixture used consists of three parts of ice in small pieces and one part of powdered rock-salt, its cheapness being a considerable advantage. The lowest temperature obtained in the interior of the apparatus was below ten degrees Fahr., although a still lower temperature could have been arrived at. Small thermometers were inserted in the stones, and although two hours sufficed to bring these to the temperature of the surrounding air, the stones were subjected to the process during a period of three hours. Felt or sawdust was used to procure isolation from the outer air, the former being more effectual, but the latter preferable on account of its cheapness.

In the selection of the stones, as well as in the general conduct of the experiments, Herr Blümcke had the advantage of the advice of Professor Gottgetren, the trials being conducted in the laboratory of Professor Von Beetz. The stones were in cube form, the length of the sides being about three and one-fourth inches, and the surfaces roughly dressed. Two specimens were tested in each case, and one of them was completely saturated with distilled water. Boiling was, however, avoided, so as not to expose the material to a degree of heat which it is not in practice called to endure. When a material

is very porous it is impossible to freeze it when thoroughly saturated. After removal from the refrigerating apparatus the cubes were placed in a small trough covered with water, and left there three hours, so as to be again brought to the temperature of the room. When taken out the stones were covered with a coating of hoar frost, and if then left for some time in water a loosening of small particles was perceptible in the portions not capable of resisting frost. Before the next subjection of the stones to the refrigerating process the surfaces were gently rubbed with a feather. Herr Blümcke repeated the process until distinct traces of injury were visible, such as cracks, peeling, loosening of corners, etc. If a stone had been ten times subjected to the frost, with such traces appearing, the quantity of the mass separated after the evaporation of the water was ascertained, and the process continued until destruction commenced. A second cube was subjected to a stream of water during one hour upon three sides. In this case there was no attempt made to ascertain the loss of volume, but the application of the water was continued until injury became apparent. These external appearances were quite the same as if the stone had been saturated, but were considerably later in manifesting themselves.

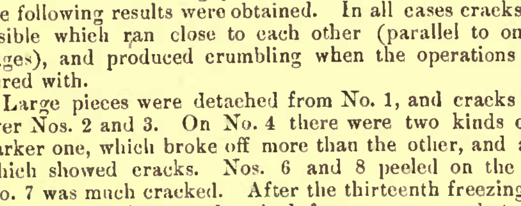
Name.	Specific gravity.	Water taken up in per centage of volume.	Number of freezings.	Loss in weight. Gramme.
1. White, Langenzenn	1.97	22.6	2	5.0088
2. Green, Ellingen	2.00	24.1	3	0.7446
3. Grey, Oberdachstetten	2.06	21.1	3	0.5910
4. Yellow, Lengast	1.83	32.6	3	0.4562
5. Red and White striped, Waldaschaff	2.22	11.0	3	0.4067
6. Green sandstone, Albech	2.14	18.1	4	0.2885
7. Yellow, origin unknown	2.34	14.6	6	0.2541
8. Yellow, Zeil	2.18	13.9	8	0.1058
9. Grey, Gründen	2 44	13.7	13	0.0885
10. Red, Rothenfels, A. M	2.31	11.3	24	0.0820

From these experiments Herr Blümcke has deduced the theory that a material has higher properties of resistance to frost, according to the restriction of the loss in weight caused by the repeated application of the freezing process. In trials made upon sandstone the following results were obtained. In all cases cracks were finally visible which ran close to each other (parallel to one or several edges), and produced crumbling when the operations were persevered with.

Large pieces were detached from No. 1, and cracks appeared all over Nos. 2 and 3. On No. 4 there were two kinds of coatings, a darker one, which broke off more than the other, and a lighter one which showed cracks. Nos. 6 and 8 peeled on the surface, and No. 7 was much cracked. After the thirteenth freezing of the ninth type a splinter became detached from one corner, but cracks parallel to the edges were not visible till after the forty-third freezing.

By proceeding in this way it is not necessary to wait for the visible destruction of the material. Coupled with the definition of the degree of resistance to frost is an approximate estimate of the period a stone will last, as it is not difficult to arrive at the number of alternations during an average winter between frost and thaw. When thoroughly saturated stones are tested the results are applicable to the most unfavorable circumstances, and are consequently the more reliable. Should a material not show injury at the temperature applied, this fact does not establish its power of resisting frost, but renders advisable the trial of a still lower temperature: in no case, however, below the range to which, in practice, the stone would be subjected. Finally, Herr Blümcke does not claim that he has solved all the questions connected with this interesting subject, but considers that his illustration of what may be done with simple means by skilful and capable hands may not be devoid of value to the cause of science.— *Timber Trades Journal.*

THE YEAR'S WORK IN BALTIMORE.



THE past year in this city has been marked by considerable activity in building. The records show the total number of permits issued for new structures, for the twelve months ending December 31, to have been 2,970 — with 664 additions and alterations. This exceeds the number for 1884 by 426. The Pratt Free Library, completed at the beginning of the year, was formally opened January 4. The building has a frontage of eighty-seven feet on Mulberry Street. It is of white marble and thoroughly fireproof. It cost $225,000, and has shelving for 200,000 volumes. It begins with 20,000, and is free to all persons over fourteen years of age. There are four branch libraries in different sections of the city, costing $50,000 more. Mr. Enoch Pratt gave the building and ground upon which they stand, with his personal check for $833,333.33, on condition that the city of Baltimore guarantees an income of $50,000 per annum. The total gift amounts to $1,145,833.33, and unlike most public benefactors, Mr. Pratt lives to see his noble intentions carried out, as he intended they should be. In a little over two weeks the total number of persons registered has been over 9,000. The completion of the Hotel Rennert marks a new era in hotel architecture here. It is designed to be thoroughly perfect in all its arrangements, so far as the skill of the architect and the desire of its owner can make it. Cost has not been considered so much as good construction, convenience, and beauty. It fronts ninety-three feet on Saratoga, one hundred and forty-four on Liberty, and one hundred and eight feet on Little Sharp Street. It is seven stories high, and entirely fireproof on first and second floors, with concrete partitions, and plastering on wire lathing in the remaining floors. A feature is the open promenade on the flat roof of the east wing, which can be covered by awnings and used as a dining-room during the summer. The view from this point embraces the entire city and harbor. The hotel contains one hundred and twenty-three rooms for guests, and forty private bath-rooms. The principal rooms and corridors are very elaborately finished with natural woods, parquetry floors, and rich color-decorations. The exterior is of red brick and Longmeadow stone, elaborately carved. All the dormers, cornices, and other roof-work, are of copper. The mass is quite effective and the color good. The new Post-Office has made good progress during the year, and now shows itself very plainly above the surroundings, being up to the main cornice. It is a massive pile, and bids fair to stand preëminent among the buildings of the city, for good construction, and straightforward, dignified design, for many years to come. With its site it has cost, to date, $1,177,495, and there remains, of the present appropriation yet unexpended, $353,504. It will require much more than this to complete the work. It stands opposite "Monument Square," in the centre of which is the marble shaft erected to the heroes of the war of 1812, and is singularly fortunate in having ample space around it for a view of its principal façades.

The Johns Hopkins Hospital has now thirteen buildings erected and finished, except the furnishing, on its property of fourteen acres on North Broadway. The site is one of the most commanding possible, and the buildings, of red brick and Cheat-River bluestone, form a magnificent group, which can be seen from all directions. The Hospital will probably be ready to receive patients within the year 1886, and the remaining buildings will only be erected as needed for increased accommodation. It is proposed to establish the Medical School of the Johns Hopkins University in connection with the Hospital, in buildings to be erected within a convenient distance. The University is at present erecting a building as a Physical Laboratory, and Astronomical Observatory, of brick and brownstone, seventy-one feet by one hundred and seventeen feet, and ninety-five feet high. The Merchantile Trust and Deposit Company has nearly completed its new building. The design comprises two equal parts with gables of the same height, each having a large semi-circular window. These are connected by a lower central curtain containing the doorway. The materials are red brick and Longmeadow brownstone, decorated with carving, seemingly much too delicate for the great mass of the building. The detail of the exterior is strongly suggestive of Mr. Richardson's work, and is unique in this city. The interior is in one vast apartment with flat ceiling in square panels, treated in bronzes. A broad frieze of buff and red tiles encircles the room. The structure is as burglar and fire-proof as art can devise. The Union Passenger Station of the Pennsylvania Railroad is nearly ready for occupancy. It is sixty feet wide and two hundred feet long, of red sand-brick in red mortar, and all details in terra-cotta. It stands on a level of twenty-five feet below the street grade, and presented a problem which required exceptional architectural skill in its treatment. That this problem has not been met with entire success is apparent, but the building is well arranged for its practical uses, well constructed, and supplies a very pressing want of the travelling public. The iron train-shed is one hundred and four feet wide and three hundred and sixty feet long. The entire work will cost over $150,000. The new United States Marine-Hospital just North of the city is progressing well. It consists of seven detached buildings, mostly of brick. The new structure of the First Methodist Church, located on St. Paul Street, beyond the northern boundary, comprises church, parsonage and chapel in one group. The material is a local gneiss, of a cold and rather harsh color, treated entirely in mass, with very little detail. The high conical roofs are of fluted, dark-colored, glazed tiles. The chapel for service, which forms a kind of semi-circular apse to the main structure, has just been opened. It has a deep gallery entirely around it — seating 1,500 — with class-rooms below closed by large doors from the main floor, which resembles the orchestra of a theatre. The woodwork is of quartered oak, and the vaulted ceiling and the walls of the gallery are treated entirely with gold, each leaf showing distinctly, and producing the effect of mosaic. The church stands above the street level, and forms a very effective mass with its terraces and arcaded porches. The tower and the interior of main audience room are incomplete as yet. Messrs. McKim, Meade, and White are the architects, and the cost will be about $130,000. The same architects are building a residence for Robert Garrett, Esq., which will be the most elaborate and costly house in the city. It fronts sixty-two feet on Mt. Vernon Place, and is in three stories — entirely of Belleville brownstone. The entrance is by a closed porch twenty-two feet long, projecting nine feet beyond the building-line of the street, and reaching to the second floor. It has been for some time the subject of a

law-suit, as it is claimed by the adjoining owner that his light and view are much interfered with by its great projection. The court has ordered its removal, but the case has been carried to the Court of Appeals, which has not yet rendered its decision. In the interests of good architecture it is to be hoped that the lower court will be upheld. The façade of the house is Italian Renaissance, and is rather flat and uninteresting. The interior is fitted up in a style of great magnificence, and it is said the building will cost nearly $1,000,-000 when completed. The construction is fireproof throughout, and very substantial. Miss Mary Garrett has recently occupied her residence, on the corner of Mt. Vernon Place and Cathedral Street, which has been for several years in the hands of the same architects. The interior has been entirely remodelled, and a conservatory and fireproof picture-gallery added. The house is one of the older structures in the city, and is of charming Italian design. It is of brick, painted a delicate cream tint. The basement, and all door and window enrichments, and other exterior details, are of white marble. The interior is sumptuously fitted up, and the picture-gallery wainscoted in dark oak, carved, and inlaid with Italian designs in satinwood. The glazed gallery leading to it from the library is in polished Sienna marble, with a domed ceiling, having a frieze and cornice of polished brass. The dining-room is said to have cost $30,000, and is entirely in dark oak, richly carved. CIVIS.

THE CASE OF H. EDWARDS-FICKEN, ARCHITECT, AGAINST THE NEW YORK ATHLETIC CLUB.



Choir Stalls, St. Ann's Church, Augsburg.

As the history of this case must possess an interest for the profession at large from more than one point of view, I will give it in detail, presenting only such facts as have ample evidence to sustain them, and as produced in my suit against the Club.

It would have seemed, in this particular instance, that an architect could never have been more strongly intrenched in his employment by a client; every safeguard had been thrown around his professional relations with that client, and yet, without warning, and at the completion of one of the most important stages of the work, an architect found himself forced by that client's arbitrary disregard of all moral and legal principle into the most repugnant position of one who must enforce his rights by recourse to the law.

In April, 1884, I was visited by Mr. T. R. Keator, at that time an agent for Rosendale Cement, Ingham's Enamelled Brick, and Swiss Tiles, and Mr. A. H. Curtis, then vice-president of the Club, and both members of the Executive Committee of the Club, and was asked by them to take part in a general competition for the proposed building the Club thought of erecting. This I positively refused to do unless the competition was limited, and a sufficient remuneration offered to make it worth while to go into it. A few days later Mr. William R. Travers, the president of the Club, called upon me and said that, from the special qualifications he believed I possessed as an old gymnast and athlete, I could better sympathize with the Club's wants, and therefore he would see to it that the work was given me direct.

It was finally so decided and announced to me at a meeting of the committee, to which I had been invited to consult with it as to the possibilities of building on three ordinary inside lots. At the committee's request I made a full set of quarter-scale plans, with a sketch of the street front, for use at a meeting of the full Club, and at this meeting I was present and explained the plans to the members, and the widest publicity was given the whole affair. Shortly after, the Club purchased the present site on the corner of Fifty-fifth street and Sixth Avenue, and I again met the committee in consultation, and it was decided to limit the expenditure to $100,000, with a margin of $5,000, and the general scheme of the building was discussed, and more or less decid d upon.

I was asked at this meeting if I could guarantee that the building should not exceed this limit. I said positively, No! It was beyond my province and power to do so; they had given me more requirements than could be possibly carried out for the sum mentioned, leaving it to my discretion to do the best I could, and, if after the plans were roughed out an approximate estimate of their cost should prove the limit was being exceeded, they must simply cut down until the limit was met. The committee gave assent to this as the only thing they could do.

The Club experiencing some trouble in raising money for the building, I proposed at this stage to take my commission in the bonds the Club was issuing, as this would save it an actual outlay and relieve them of some of the bonds. The committee assented to this very willingly, *and wrote me a formal acknowledgment of my appointment as its architect, and the placing to my credit of $5,000 worth of the bonds as five per cent upon the round sum of* $100,000, whatever extra commission I might be entitled to on any amount over that sum was to be paid me in cash.

I now proceeded to make a regular set of working-plans, and submitted them to the committee when the study of each floor — very diverse in arrangement and construction — had been completed. This was within ten days from the date of the last meeting. Surely not an unreasonable time. The plans were formally approved, and there was not even a suggestion made of any desired changes. Proceeding farther with the work, I developed the plans to the fullest detail, commenced writing the specifications and outlined the elevations. From this time on I was visited every week by the various members of the committee, excepting Mr. Travers, and principally by Mr. Keator.

It had been considered a good thing that Mr. Keator should be on the building-committee, from his intimate knowledge of building, derived from his occupation as agent for cement and glazed brick, and he had already sent me samples of his brick and tiles for ready reference.

Every time any members of the committee called they had new suggestions to impart that had occurred to them since their last visit, rendering it necessary at least three times to completely redraw the plans, and numberless times to redraw and restudy various parts, and in spite of my remonstrances as to the time involved and the additions they were making to the cost. *These remonstrances were met with the remark that they cared nothing about the cost, and wanted the handsomest building in the country.*

The plans were finally completed to their entire satisfaction; but at this time Mr. Keator was hurriedly called to Europe. Before leaving he informed me that the committee would do nothing about procuring estimates till his return, and that I need not get the plans ready for estimating till he did return. During his absence, some six weeks, I was employed superintending the excavations, and saw but little of the committee. While Mr. Keator was in England I sent him, at his request, tracings of the parts of the building where his glazed brick was to be used, in order, as he wrote to me, to order in advance the quantity required. On his return I immediately got the plans ready for the builders to estimate upon, and was presented by him with a list of contractors he wished to bid upon the work. Very naturally, I said I would prefer to change one or two of the names to men I had better knowledge of, as only one of them had ever done any work under my care, and that one I positively refused to have anything to do with, his work had been so unsatisfactory, and this name was agreed to be changed to one I suggested.

This list was presented to the committee by Mr. Keator as our joint labor, *with the names changed back to the original list.*

The plans and specifications being now fully completed, they were once more gone over and formally accepted by the full committee. Lithographed copies were at once made and delivered to the builders, who were privately notified by the secretary to send their estimates — not sealed, to the architect, but to the office of Mr. Keator.

A day or two later I received a notification from the committee that my employment should cease, alleging that I had consumed too much time making the plans, and that they exceeded the limit placed upon their cost, and adding they were willing to settle with me for my services so far, *at any reasonable sum.*

I demanded a hearing, and this was acceded to, and was informed that the lowest estimate received was over $160,000. I endeavored to dispute the exactness of this, but received no satisfaction.

I now procured an honest bid myself of $105,700, and sent it to the committee, accompanied by the proffer on the part of the builder of bonds to any proper amount, or the retention by the Club of a percentage on his payments till the completion of the building, large enough to guarantee the Club.

The only acknowledgment of this was the return of the tender, with the reply that the Club had *never ordered any plans from me at all.* This was so extraordinary that I at once employed counsel to proceed legally against it.

It is in such circumstances that most members of the profession would think it necessary to support the injured party to the proper upholding of the dignity of it, for better protection in the future, and by their sympathy give both moral and practical aid to the righting of such a grave professional wrong. This is what did happen in this connection: Mr. Keator and Mr. Wood called upon Mr. Charles Clinton within a few days after my reception of their letter of dismissal, and asked him to go on with the work. Mr. Clinton, without a word to me, supplied them, a day or two later, with a set of one-eighth scale plans, made on tracing-paper, and upon these — unaccompanied by any specifications whatever—a contract was closed, without competition between builders at all, with a firm of contractors named Smith & Prodgers, for $118,000.

During this period Mr. Keator had not returned me a set of plans he had specially asked for, and had obtained at the same time they were first sent out to the builders from my office.

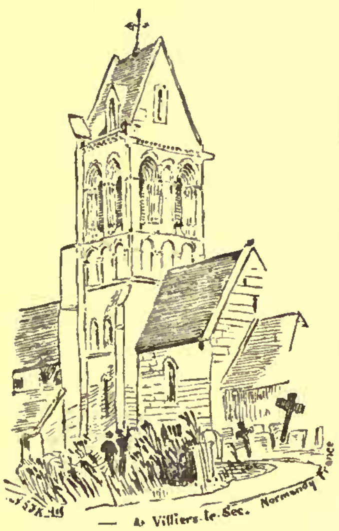
I merely state facts. Intelligence now reached me of Mr. Clinton's going on with my work, and I at once informed him that I considered

it extremely unprofessional for him to do so, the committee not having yet settled with me. Mr. Clinton's interest in the matter may be gathered from his complete avoidance of the exhibition of any—so far as I was concerned.

A long and tedious suit now commenced, and has just been decided so far in my favor that I was paid by the Club, without appeal, the award of three and one-half per cent upon the sum of $105,700 and the cost of the suit.

I may add in conclusion, that I shall be glad to send any further particulars, or be of service in any way to the profession at large, to any one to whom this case may help as a precedent for recovery of fees under any similar circumstances. I fervently trust, however, that my opportunity for such service may be scarce, and that the knowledge of the result in this case may serve as a deterrent to those clients who feel no responsibility for their acts till it is brought home to them. H. EDWARDS-FICKEN.

BOURGES.[1]



THE primatial church of all the Aquitaines must claim a high place in the first rank of the churches of Christendom. Its size, its majesty, the sublimity of its effect within and without, are excelled by very few buildings, and it has the special charm which attaches to every building which has some great feature peculiar to itself. The metropolitan church of Bourges is an attempt at the solution of a great problem, a problem which we have already had brought before us at Clermont. Possibly we might get more easily tired if all French minsters followed the type of Bourges; but it is certainly well to have at least one church of the very highest class in which that type is followed. Bourges shows what can be made of an outline which we are apt to think belongs only to much smaller buildings—the outline from which transepts are absent. Alby, which carries the same experiment yet farther than Bourges, which dispenses with aisles as well as with transepts, which has its single western tower, like the most ordinary parish church, is, with all its wonder and all its grandeur, not a church of the first rank. It is no rival to Bourges in breadth, length, or height. And Alby is essentially an Aquitanian church, which the head church of Aquitaine is not. Bourges is a French church, and it seems logically to carry out the principles of a French church. Norman and English minsters have transepts, because they have mid-towers to carry; but when there is no mid-tower, the question at once starts itself, Are not the transepts as well away? In a crowd of French churches, they seem to ask for their natural crown, and not to get it. At Bourges the crown is not missed, because there is nothing that asks for it. Few external effects are grander than that of the church of Bourges from the south-east. No building better carries out the received metaphor of the ship. The one vast body, its length unbroken by even a *Dachreiter*, seems pushing its way westward over all obstacles; we might even go on and say that the flying-buttresses suggest the notion of oars, and that the ranges of them, one above another, call up the memory of the trireme; for at Bourges they are indeed ranged one above another. Simple as the plan of the church seems in one way, it is all complexity in another. It is the very opposite to St. Ouen, where we admire the grand simplicity of aisles and clerestory, with the vast buttresses standing in all their stateliness, unencumbered by chapels thrust in between them. But Bourges has no such intruders, such parasites, as those which have thrust themselves in between the buttresses of Amiens. At Bourges we have five bodies, one rising above the other. The central nave soars above all; but the aisles, each with its own clerestory, soars no less over the lower aisles beyond them. It is like the degrees of rank in feudal realm; the lesser nobles gather round the dukes and counts, and above dukes and counts rises the single king. The apse, of course, is of the true French pattern, perhaps made a little more complicated than usual by the arrangements of the inner aisles. As if in consequence of the strength of the older substructure, the chapels round the apse hang in the air, borne on corbels, like oriel windows, or like the turrets of many a house both in France and Scotland. We walk round the vast building; we feel thankful for the noble Romanesque doorways surviving north and south to remind us that older churches, as glorious it may be, in their own way, once stood on the same site. First or last in our survey of the outside, according to the path by which we go up, we stand and gaze at the vast width of the western front. Here is no need, as at Wells and Rouen and Poitiers, to seek for width by carrying the towers north and south to the actual church. Here at Bourges are five bodies, each needing its finish to the west, and the towers naturally finish the outer ones. Two unequal towers, neither perhaps ideally finished, one showing signs of Renaissance at the top, are not according to English, hardly according to Norman, taste. And we must regret the need which was found, ingenious as was the expedient by which the need was met, to support the southern tower by the hugest of flying buttresses. But the whole effect is stately and striking; and the doorways—on them lovers of sculpture detail might spend hours and days.

We pass within one or other of the doorways, and we find that the inside of St. Stephen of Bourges is one of the stateliest in the world. Whatever one may think outside, within at least the absence of transepts is not felt as a lack. Indeed, while outside we cannot help noticing that there are no transepts, within we hardly think about the matter at all. We look eastward and westward; we hardly trouble ourselves with the thought that the ranges of pillars eastward and westward are, unlike every other church of such a class, altogether unbroken. We are in a Gothic minster, in one of the noblest of Gothic minsters; in one, moreover, of most complicated outline and ground-plan; and yet, as we look eastward, the church has the unity of a basilica. It is in fact one of the great basilicas, with their many ranges of columns, translated into the architectural language of a later age. And nowhere surely does that architectural language speak with a nobler voice than it speaks among the pillars of the church of St. Stephen, ranged row on row, like those of the old Imperial St. Peter's, boundless alike, as it seems to the eye, in height length, and breadth. Yet, with all the grandeur of this noble interior, one who comes from Limoges and Clermont may be tempted to ask whether those far lowlier buildings do not show more real skill in the design of their internal elevations than is shown in the patriarchal church of Aquitaine. The interior of Bourges is unspeakably sublime; but we are not sure whether some churches which are less sublime in their general effect will not better bear critical discussion. One of the most striking features at Bourges, a feature in which that church has some likeness to the Gothic part of Le Mans, is the prodigious height of the pillars, and consequently of the inner pair of aisles. These aisles rise above the outer aisles just as the main body of the church rise above them, and they are treated just like the elevation of a nave, showing a perfect design of arcade, triforium, and clerestory. Now these aisles are fully of the height of the main body of some great English churches, and the effect is not at all that of a smaller object treated as a miniature of a greater. The effect is rather as if, by some astonishing process, we looked into another church, and this effect is not altogether pleasing. And, if we look for mere detail we shall certainly find Bourges outdone by many lesser churches. One might even say that a certain plainness, almost bareness is a characteristic of the building.

Standing thus in the great church of central Gaul, looking southward and northward, we cannot help comparing this building, Southern in site, Northern in style, with some of the great buildings on either side of it. We look north towards Normandy; we look south towards more unmistakably Aquitanian lands. We see how the local styles, Angevin, Aquitanian, Arvernian die out in the thirteenth century. The French conquest of Normandy came so early in that century that there was no time for the growth of a variety of Gothic, either locally Norman, or common to Normandy and England. Normandy, to be sure, stuck stoutly to the tradition of the central tower which it shared with England, and, down to the last days of Mediæval art, it kept also a tradition of better and purer detail than we find at the same date in other parts of France. But we can hardly say that there is a Norman-Gothic style; there is nothing in Normandy answering to Alby in the later half of the thirteenth century. That wonderful building is essentially Aquitanian and not French; it is perhaps the only cathedral church built in a truly local style after Gothic forms were fully developed. But Normandy and Aquitaine, and all other parts of Gaul, as they became French, became French in architecture as well as in other things. There is certainly far more likeness among the great churches of France from the fourteenth, even from the thirteenth century onwards, than there is among the great churches of England. Neither local nor personal taste had such free play as they had in England. It would be hard to find the same kind of differences in the same number of Great French Gothic churches, as those which distinguish the early Gothic of Wells from the Early Gothic of Ely, or which mark off three distinct varieties of the Later Gothic at York, at Gloucester, and at Winchester. One result is that through all Southern Gaul, so many of the great churches seem exotics. They are French buildings on Aquitanian soil; they are like the royal officials in an Aquitanian town or district alongside of the native consuls. Churches like those of Bayoune, of Clermont, and of Limoges, look always like foreign settlers in a strange land. If we do not feel this so strongly at Bourges, it is because we hardly feel that Bourges is Aquitanian soil. It may enlarge our minds in all directions, if, when we have taken in this last fact, we look back for a moment to the days when the West-Gothic king, lord of the Aquitaines, had to defend Bourges from a Breton assault, when the Breton and the Frank were the allies of Rome, and the Goth and the Saxon were her enemies.

But the great church of Bourges is not the whole of Bourges. We have the house of Jacques Cœur; we have several other grand houses of still later date. But there is no great church, like St. Ouen, St. Sernin, and St. Taurin of Evreux, to rival St. Stephen's. Of smaller churches, many have perished, and those that remain are

[1] By Dr. E. A. Freeman in the *Guardian*.

of comparatively small account. The church now called Notre Dame, though its real dedication is St. Peter, draws some slight interest from its strange, irregular shape, and more from its lofty tower, the upper part of which has much likeness to the batter-tower of the metropolitan church, and is said to be the work of the same architect. St. Bonnet is of still less consequence. But there is another church of St. Peter lying just outside the Roman inclosure to the south-west, which is of much higher order. It is a really fine church, and one of a type which again suggests some comparisons between French and English buildings. In England such a building could never have stood as the whole of a small church; it might very easily have stood as one half of a large one; St. Peter at Bourges would make an admirable choir for a small minster; according to English notions, it needs transepts, mid-tower and nave to give it any kind of shape or proportion.

HENRY A. NISBET.

AT a regular meeting of the Rhode Island Chapter, held the 25th inst., the following minute was presented:

Henry A. Nisbet died at St. Luke's Hospital, Denver, Col., Dec. 18, 1885, after an illness of four weeks. Mr. Nisbet was a junior member of this Chapter, from March, 1876, until the summer of 1884, when failing health compelled him to leave Providence and seek a home elsewhere.

He was born and educated in Scotland. He passed many years in this country in various offices as an assistant, and also in full practice of his profession. He died away from relatives and friends, but there are many who will mourn his loss. He was esteemed by all who knew him as a well-trained architect of modest worth, of quaint humor, and of a sensitive and artistic temperament. His death removes a personal friend of each member of this Chapter.

EDWARD I. NICKERSON, *Secretary*.

SOCIETIES

THE T-SQUARE CLUB.

THE T-Square Club, of Philadelphia, held its annual meeting in December last, and elected its officers. Mr. John Stewardson was made President, Mr. Louis C. Hickman, Vice-President, and Mr. Walter Cope, Secretary and Treasurer. The Club was founded about three years ago, mainly by the efforts of Mr. Cope, with the object, as the Constitution says, "of promoting social intercourse and a spirit of friendly rivalry in architectural design." Its membership consists of the younger architects and the architectural draughtsmen of the city. Originally having fortnightly meetings, with monthly competitions, with a series of fines for those who did not attend or compete, it was reorganized at the last annual meeting, on a somewhat different basis. The fines are now abolished, and the meetings are less frequent, there being but four regular meetings held through the winter months.

The programmes for the competitions are prepared from one meeting to the other. The drawings are handed in by noon on the day of the competition. In the evening they are displayed on the walls of one or the other of the architects' offices.

Three prizes are awarded; the merits of the different designs being decided upon by all the members present, a general criticism first being indulged in. Each member then votes, placing his favorite designs first, second and third, as he judges best.

For the first competition-meeting the subject chosen was, "A Monument to an American Commander-in-Chief." The first prize was awarded to Mr. Lindley Johnson; the second to Mr. Walter Cope, and the third to Mr. Wilson Eyre. At the last meeting the prizes were awarded to Messrs. Arthur Truscott, Wilson Eyre, and John J. Dull.

The founding of this Club, and the enthusiasm of its members, are worthy of note; for in Philadelphia there seems to have been a lack of fellowship and interest among the younger men and the draughtsmen of the profession. The Philadelphia Chapter of the American Institute has made noble efforts, but it never received the response that it deserved.

THE GROWTH OF TREES. — A Danish clergyman named Hansen has made some experiments relative to the growth of human beings and trees. Regarding the latter, Mr. Hansen has made daily measurements of a number of trees in the garden of the institution, and has convinced himself that a period of growth in length, as represented by the branches, twigs and tops, alternates with another of increase in bulk, that is, in the circumference of the trunk, followed by a third period of equipoise or rest. In April and May, the entire force of the tree was expended in lengthening the branches, while the thickness of the trunk remained stationary; all through May the most exact measurement failed to discover any increase of bulk; but in June, until the middle of July, when the new twigs had been all formed; it was the trunk that absorbed the nourishment from the roots and bulged out. Then came the period of rest and inactivity. — *Timber Trades Journal.*

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

SCHOOLS OF ARCHITECTURE.

STIALBROY.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Could you give me the addresses of several good schools of architecture? I intend making the business of an architect my future occupation, and was told by Mr. R. J. Edwards, architect, an architect of Toronto, Ont., to write to you, as you could give me the information I wanted. Give me the addresses of as many schools as you can, so that I may make a good selection.

Yours, etc., ED. C. DINGMAN.

[The Massachusetts Institute of Technology, Boston, Mass.; School of Mines, Columbia College, New York, N. Y.; Cornell University, Ithaca, N. Y.; Illinois Industrial University, Champaign, Ill. — EDS. AMERICAN ARCHITECT.]

BUILDING IN BOSTON.

BOSTON, MASS.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Will you please inform me what valuation and amount of building was done in Boston in the past year in comparison with the year previous? If not asking too much, you will oblige,

Yours respectfully, W. A. ROBINSON.

	1884.	1885.
[ESTIMATED cost of completed brick buildings,	$5,400,775	$6,218,800
" " wooden "	3,078,145	4,552,538
" " alterations and additions,	1,983,287	2,560,212
	$10,462,207	$13,331,550

That is, the building operations for 1885 exceeded those of the previous year by $2,869,343. — EDS. AMERICAN ARCHITECT.]

BOOKS.

ST. PAUL, MINN., December 5, 1885.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— In the issue of your paper of November 28 you publish a list of books for professional reference and study. Can you inform me where I can obtain some of these, or learn the price? The ones I refer to especially are "*Lives of Celebrated Architects*," "*Vignola*," "*Vitruvius*," "*Specimens of Early French Architecture*," Pugin's "*Architectural Antiquities of Normandy*," Scott's "*Lectures on Mediæval Architecture*. If you can refer me to some bookseller in this country or abroad who would be likely to have the above you will do me a great favor. Yours, W. F. THOMPSON.

[WE have not been able to discover that any of these works can be obtained in this country, and perhaps the surest way to obtain them would be to place the order with B. T. Batsford, 52 High Holborn, London, W. C. The Italian work of Milizia on the lives of the most noted architects was translated in 1826 by Mrs. Cresy, and can probably be bought for $2.00 — if found. A translation of Vitruvius is included in Weales's series, and can be got through any leading bookseller — Little, Brown & Co., of Boston, for instance. There are French and German translations, or, rather, *preparations*, of "*Vignola*," but we do not know of any in English. Johnson's "*Specimens of Early French Architecture*" is scarce and costly ($25 and upwards). Pugin and LeKeux's "*Architectural Antiquities of Normandy*" was published at £6. 6s, but can be picked up for less. Scott's "*Rise and Development of Mediæval Architecture*" is published by John Murray, 50 Albermarle Street, London, in two volumes, price, two guineas. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

DISCOVERY OF A CHRISTIAN CHURCH AT SFAX, TUNIS. — At Sfax, in Tunis, workmen have come upon baptismal fonts covered with mosaics, which are clearly Christian in origin. A Christian church, with remains of mural paintings, has also been found in Constantinople under neath a mosque.

CREMATION IN FRANCE. — Decorative artists and sculptors are preparing to adapt themselves to the crematory movement which has now in its favor a vote of the Municipal Council adopting the plan of a mortuary furnace, and granting a site in Père Lachaise, where it will operate early in 1886. The expense of cremation is not, it is settled, to exceed fifteen francs. The municipality will, at a future sitting, vote the construction of a sort of lay temple, where families will be allowed to keep urns or other funereal vessels containing the ashes of dead relatives. This will not necessarily do away with any religious ceremony short of that of consigning the dead to consecrated ground; but as M. Koechlin Schwartz says, there is no reason why urns may not be consecrated, or why Protestants, Catholics, Jews and Free Thinkers may not subscribe to build a vast mausoleum, in which the ashes of thousands could be deposited in beautiful vessels without injury to the living. It is probable that cremation, being now legal in such an art-centre as Paris, new and beautiful forms of artistic decoration will grow out of it. The time required for the combustion of an adult at Père Lachaise will be two hours. — *London Daily News.*

An Anecdote of Millais. — "Now that all London is flocking to see the great and noble collection of works by Sir John Millais at the Grosvenor Gallery," says the *Leeds Mercury*, "a little anecdote about the painter himself — for the absolute truthfulness of which we can vouch — may not be out of place. When a very young student, Sir John used to sit next a much older boy in the art class, whom we may distinguish as X——. His student-days at an end, Millais lost sight of X——, who, abandoning his ambitious dreams of fame, took to the useful but humble profession of a drawing-master in a London suburb. Some two or three years ago Sir John was walking along a street in Camberwell, when he met a man whose face he recalled, through the mists of years, as that of his old fellow-student. He accosted the drawing-master. 'I beg your pardon, sir,' said X——; 'but you have the advantage of me.' 'What! don't you remember Millais?' 'Bless my soul!' cried the other, 'Are you really little Johnnie Millais? Why, how you have grown!' He looked up at the tall figure of the painter for a moment in wonder and admiration. 'And how are you getting on, X——?' asked Sir John. 'Pretty well, sir; pretty well. Not quite so well as I thought I would do in the days when I knew you; but probably quite as well as most of us have done. But about yourself, Mr. Millais? Have you been prosperous, and do you still follow the profession?' Sir John laughingly explained to his old friend that he did 'still follow the profession,' and, after a few more words went on his way with a truer knowledge of the limitations of fame than he had ever possessed before."

Lacquer-Work of the Burmans. — The Burmese lacquer-work is not unlike that of China and Japan, but is made exclusively of small bamboo strips. These latter are woven into circular boxes of all sizes, from betel-pouches to house-trunks. The first step in the lacquering is to smear the box with a mud containing (or not, according to quality) a proportion of the black varnish called *thittsee*, obtained from *Melanorrhœa usitatissima*. Next follow sun-drying and polishing in a lathe with soft sandstone and water. A coat of the varnish, mixed with bone-ash, is then applied and rubbed down; another coat, containing less bone-ash, and another rubbing-down, succeed; then a final coat of varnish is polished, giving the box a smooth, brilliant, black surface. The pattern is put on in black and red. First, black lines are run round the box by a kind of style or point, fixed in a bit of wood or bamboo, so as to leave a slight projection, the point being charged with black varnish; on rotating the box in the lathe in contact with this style, the necessary black lines are produced in relief. These being completed, the box is entirely covered with a coating of a red paint from vermilion ground up in a vegetable oil (*shantsee*), so thick as to conceal all the black lines. This dry, a rubbing-down with rice-husks and water in the lathe removes the red color from the prominent black lines. Any additional colors are successively applied, and the pattern developed by a steel style, pointed at one end and flattened at the other. The market value of the finished box depends on its elasticity and the fineness of the pattern. The best will suffer bending double, without injury to the lacquer; a three-inch betel-box of this quality may fetch as much as a couple of guineas. — *Journal of the Society of Arts.*

The Recent Discoveries at Rome.—Of the bronze statues recently discovered in Rome the London *Athenæum* says: "In clearing the rubbish which filled up the space between the first and the second wall, at a depth of seventeen feet below the level of the southwest corner of the platform of the temple, a bronze statue was discovered lying on its back. This magnificent figure is 2.22 metres high, and represents a naked athlete, or at least a man of the athletic type, whose features are evidently modelled from nature — in other words, it is a portrait head. The figure stands on the left leg, the right being extended a little forward. The right arm is bent behind the back and rests on the haunches, as is the case with the Vatican 'Meleager' and the 'Hercules' of Glycon. The left arm is raised high above the head, and was supported by a rod, the traces of which are seen on the forearm. On the breast of the figure the following letters are engraved: L. VIS. L. XXIIX which have given rise to much speculation. The truth is that nobody has been able to give a satisfactory explanation of these mysterious signs. About a month later, the space between the second and third walls being excavated under the same circumstances, a second bronze statue was found, which had not been buried in haste, but carefully concealed. The figure, being in a sitting posture, as I shall presently describe, had been placed on a stone capital of the Doric order, as upon a stool, and the earth which surrounded the figure had been, as it were, sifted, in order to save the surface of the bronze from any possible injury. All these details may help us in stating, with a certain degree of proximity, the reason and the epoch of the concealment of these noble works of art. The figure represents a powerful boxer of barbaric type, who, after fighting gallantly, sits down exhausted by the numerous blows received, the traces of which are visible all over his body. The torso bends gently forward, and the elbows rest on the knees. The face, of Herculean type, is turned toward the left; the mouth is half open, and the lips seem to quiver, as if speaking to some one; in fact, I have no doubt that the statue belongs to a group. No words can describe the realistic impression created by this magnificent specimen of a semi-barbaric athlete. His nose is swollen from the effects of the last blow received; his ears, his shoulders, his breast, are seamed with scars. He is panting from sheer fatigue, and seems to take a moment's rest, ready to start again at the first call. The modelling of the muscles of the arms and of the back is simply wonderful. The details of the fur-lined boxing-gloves are also exquisite. This bronze belongs to the best period of Græco-Roman sculpture. The only sign which can give a clue to its origin is a big A (αλφα) under the middle toe of the left foot, not engraved after the casting, but cast at the same time with the statue. There is no doubt that both statues were placed in the Baths of Constantine close by, and they must have been buried in the substructions of the Temple of the Sun, just across the street, under the apprehension of the storming of the city by barbarian hordes."

TRADE SURVEYS

The undercurrent in all commercial and industrial channels of activity is running in the direction of combination. The purpose of these movements is to counteract the anticipated competition that will grow out of the rapidly increasing productive capacity in every direction. The question of overproduction will not be left to the discussion of theorists, but will be taken up, and is being taken up every day, by the practical men who control the business and transportation interests of the world. The production is greater than our distributing machinery is capable of handling. That machinery is defective in many respects. Our producing machinery is expanding every day. The practical men of the world, who look at this question from the standpoint of their ledger and bank account, are concluding that the only way to safely adjust the inharmonies with which they have to contend is to make less, and then combine, in order that competition will not jeopardize their margins so seriously as it has done of late years. This, in a nut-shell, is the objective point of the whole movement. The markets for every product of skill and labor is, of course, widening rapidly. Foreign markets are being sought for, and in some directions will afford an outlet that will be appreciated. But for the great bulk of our productions, their market is at home, and our manufacturers must act accordingly. The trade statistics of the past thirty days, particularly in the manufacturing States, show that a largely increased production is being thrown upon the market; that the encouragement afforded is serving as a stimulus to producers of all kinds, both of raw material and finished products, to railroad-builders, ship-builders, boat and bridge builders, tool-makers, and hardware manufacturers, to increase their productions, and in most cases to mark-up prices to represent increased cost of raw material and transportation.

February opens with more encouragement than January. The architects, as a rule, are fairly busy on work for spring and summer building. Those who have favored us with their views as to the volume and character of the business in hand and in sight, express the opinion that house-building will constitute fully sixty per cent of the work that will be done this year. The Western architects write as though they felt that shop-building and municipal-work and public-buildings would constitute a very important factor in this year's work. The rising municipalities of the Far West are ambitious for fine buildings, gas-works, street-car lines and municipal improvements of the most luxurious character, and are endeavoring in a small way to follow in the footsteps of such cities as Chicago, Cincinnati, and St. Louis. Our Western architects are encouraging them in their creditable ambition to make a good appearance. All through the Western States the architects are busier than usual for this time of the year. The younger men, who have settled there within two years, are making a good start, and the builders, who are executing their work, are making commendable progress, doing first-class work, and laying the foundation for a higher order of skill. This observation is not made by way of unfavorable contrast with the architects and builders of the East, for it is here that the ideas, and models, and systems, and principles are taught and learned which are there put into practice.

Within the past thirty days arrangements have been made for the loaning of large sums of money by lenders in this city, New York, and Philadelphia, for investment in more or less remote localities. Railroad construction has heretofore absorbed most of the surplus cash of the American citizen who yearns after a sudden acquisition of wealth. Of late years there has been a growing tendency to invest money where it could always be seen when desired, instead of in samples of fine lithography. In New York, particularly, arrangements have been made for the investment of money that will run into the millions in the Middle and Western States, and experts are now investigating the advisability of investments in some prosperous localities in the South. If the lenders of money are encouraged by their first steps in this somewhat new field of investment, they will put more money in the same channel. The field is a wide one and an inviting one. The masses of the people need to be better housed. It is well that investors find a double reason for putting money into building, viz., the humanitarian reason and the money-making reason. This departure is only in its infancy. Architects in Chicago and St. Louis state that there is a wide field for those who wish to invest money in this direction. The evidence of their correct judgment is shown in the springing up of manufacturing towns throughout the West and in the building activity in the larger cities. So far this year the permits granted in all the Western cities have been largely in excess of last year, while in Eastern cities the taking of permits has not yet reached any considerable dimensions.

Building material will not be higher than last year, excepting in some localities. The brick-makers, so far as heard from up to the present writing, have increased their capacity, excepting in some few cases where the advantages have disappeared through the development of better localities. The slate and stone interests are prepared to meet any possible demand that may be made upon them. The manufacturers of wood work and the builders of wood-working machinery expect to be very busy throughout the season. The lumber dealers talk hopefully of an active demand for all kinds of lumber, especially for inside finishing.

The hardware dealers have been working rather cautiously for a month or two past, waiting for spring developments. The iron and steel makers are enjoying a season of exceptional prosperity and activity.

The manufacturers of appliances and furnishments for heating and ventilating, are bringing out some very fine specimens of their handiwork, which architects and builders are recognizing in a hearty manner. Sanitary appliances of most approved design and construction are placed before builders and are being adopted. The building interests are recognizing the fact that the cheap methods of construction which obtained a few years ago are the most expensive, and that the best and most durable, regardless of cost, will in the long run be the cheapest. Our advertising columns furnish abundant evidence of the interest taken by architects and builders in these matters. Furnishing material of every conceivable kind and attractiveness is being brought to the market by the stimulus of an active demand. Little manufacturing establishments are springing up for the manufacture of novelties and specialties for the use of constructors. We are gradually departing from gaudiness and adopting a style of architecture and a system of building which is in accord with the true principles of art. The demands which flow from this departure are building up scores of little industries, which in time will become actually necessary in building economy.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 529.

FEBRUARY 13, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

TO a few amongst our readers it will not be a matter of surprise to learn that with the first issue for March we begin the publication of an enlarged and improved edition of the *American Architect*, the change being brought about by the addition to the contents of the regular issue during the year of forty gelatine prints from nature, and thirty-six double-page photo-lithographic prints. Although this change is inaugurated in the third month of the year, the subscription will cover all the issues for the current year, in order that there may be as little confusion as possible in the matter of the terminating dates of subscription. In order to do this equitably, we shall issue in this edition during the ten remaining months the entire number of plates that should go with a full year's issue, that is, thirty-six gelatine plates (four gelatine plates having been published in the gelatine edition), and thirty-six double-page photo-lithographic prints. The effect of this will be to give this year's numbers of the new edition a rather more affluent air than properly belongs to them or than can, probably, be maintained during succeeding years. About thirty per cent of the subscribers we have approached on this matter have signified their desire to become subscribers to the new edition, and from our long experience in the use of circulars we know that this means that nearly every one who took the trouble to read the circular intends to subscribe for the new edition, and in like way we know that a large number of those who have not signified their assent will do so now that the matter is no longer problematical. But as it is a matter of nice adjustment to regulate the size of the edition, it is particularly desirable that we should hear at once from every one who wishes to receive the additional plates, and we make an urgent request that there shall be as little delay as possible in notifying us of the intention to subscribe. The subscription-price will be ten dollars per annum, and present subscribers will with the first issue of the new edition be billed for the difference between that amount and the sum already paid for the current year. A common price for photographs of size and quality similar to our gelatine plates is usually fifty cents, or for forty photographs one would have to pay about twenty dollars. We offer forty unfading heliographic plates and thirty-six double-page photo-lithographic plates, to say nothing of all that the regular issue of the journal contains, for just half this sum!

WE have been sincerely pleased that subscribers have taken this occasion to say to us very pleasing and flattering things, and it has not been less pleasing that they have added advice and suggestion as to how the new edition can be made most valuable. Naturally no two men want the same thing. For instance, the first who replied hoped that the new plates would be confined entirely to American subjects, while the very next man asked us to give foreign views alone: another wishes interiors mainly, another asks for details, while still another has, in the eyes of some correspondents, the singular taste to ask for country houses. Another urges us to resume the publication of our "detail-sheets," while others call for illustrations of heating and ventilating systems, city houses, decoration, chromo-lithographs, and so on. All this shows how impossible it would be to publish a journal which should every week wholly satisfy each subscriber, but it also proves, we think, that our past course has been sailed with as delicate a touch on the tiller as such baffling winds required, and all that we can say as to our selection of future subjects is, that we shall make the most judicious mixture that our perceptions will allow. Forty plates will not make much of a hole in the vast mass of possible subjects that the world's architecture affords, but we can promise our subscribers that, if they will continue with us long enough, they shall find unfading images of all architectural achievement in every quarter of the globe transferred to their book-shelves. So much for the gelatine plates, with the quality of which you are already familiar.

NOW a word as to the photo-lithographic plates, which form really the starting-point of the present expansion, for it was in seeking to devise a way of permanently preserving and making generally accessible the *envois* of the Rotch Travelling Scholars that the present scheme was brought into shape. Naturally, then, to these Scholarship drawings, which are not only architectural records of great value, but are many of them beautiful specimens of architectural drawing in many phases, will be assigned two-thirds of the increase in this kind of illustration. These plates will be printed on a heavier paper and of a different tint, and besides the usual head-line—which will be kept close to the top so that it may disappear under the binder's trimming-knife — they will bear a generic title of their own. The purpose of this is that if a subscriber so wishes he may have these plates bound separately at the end of a year or two —for this feature will become a permanent part of this edition of the journal—or may have them bound up with the journal itself. Those who have had the privilege of seeing these drawings as they arrive from time to time, we know will applaud the step we take to save from oblivion material of so much value, and prepared with so much care. Those who have not seen them may take our assurance that these are no mere school-boy efforts; and as the Trustees have been singularly fortunate in having for their first beneficiary so intelligent, indefatigable and skilful a worker as Mr. Blackall, it is fair to assume that an effort will be made by future holders of the Scholarship to surpass in their performances the standard he has set, particularly as they will have as a guide and measure the published record of the work already done. Such publication, too, will make it easier for the Trustees to guide and control the work of the students, and by their means accomplish something in the way of consecutive and correlated investigation. To what ends the remaining plates will be devoted we think it best to make no promises. It only remains to say that it is our purpose, while doing nothing to lower the standard of the other editions of this journal, to do all we can to develop this edition and make for it a place and name as high as the highest. It may not be unwise to add that as such a publication should be treated with respect we will set the example by showing our own respect for it, and here promise that this edition shall be mailed "in boards" so as to reach the subscriber uninjured.

AN interesting and valuable gift has just been made to the State University of Michigan by Mr. Randolph Rogers, the veteran American sculptor, who, being compelled to give up work on account of the infirmity of age, has given the whole contents of his studio at Rome to the principal school of the State in which he was brought up. Independent of the value of the collection as an example of a sculptor's tools and processes, the studio contains the original casts for the bronze doors of the Rotunda in the Capitol at Washington, as well as

the models of the famous statues of "Nydia" and the "Lost Pleiad," and of many portrait-statues and figures belonging to monuments of various kinds. These will be sufficient to give the collection interest for the general public, while students of sculpture will derive a singular advantage from the opportunity which it will afford for observing the various stages of an artist's study of his design, the manipulation of the rough clay sketches, and the processes by which they are refined and carried out into detail without losing force. A bequest of this sort from a skilful and distinguished foreign painter would be invaluable to young men and women who cannot afford to study abroad the technics of the art; and a sculptor's sketches are, if anything, more instructive than those of a painter.

THE *Scientific American* has opened its columns to a discussion about the ignition of wood by steam or steam-pipes which seems likely to be very useful. In a recent number one of the many people who do not believe that wood can be set on fire by any steam not superheated, writes to ask why the wooden lagging which is placed around locomotive boilers, and then covered with a sheet-iron "jacket," does not take fire. Although locomotive boilers usually contain steam at a pressure of more than one hundred and twenty pounds to the square inch, the laggings rarely show any signs of charring, even after years of use. If the seams of the sheet-iron jacket get loose, as sometimes happens, sparks from the smoke-stack may get in and set the laggings on fire, and such accidents have sometimes occurred from the water getting low in the boiler, so as to expose the crown-sheet to the action of the fire, but there is no instance of any scorching, the writer thinks, from boilers in their ordinary condition. As thousands of locomotive engineers and master mechanics must know something of this matter, it is to be hoped that more communications may follow on the subject.

THE present winter has been so remarkable for its heavy snows all over this country that it is interesting to know how such visitations are dealt with abroad. In Paris, the snow is now rarely allowed to remain in the streets beyond a few hours, although the expense of removing it is a serious item in the annual municipal budget, forty-four thousand dollars, for instance, having been spent in removing the snow which fell on the eighth and tenth of last December, the total depth of which was about seven inches. Some years ago, the city engineer experimented upon the use of salt in removing snow from the streets, and the cost of performing the work in this way having been found to be less than one-half of that involved in excavating and carting it away, the salt removal is now adopted for all the streets in the city. According to the *Génie Civil*, as soon as snow has fallen to a certain depth, men, previously warned, issue from their stations with wheelbarrows filled with salt, which they scatter as uniformly as possible over the section of pavement assigned to them. The street is then left to itself for two or three hours, during which carriage-wheels and the feet of horses mix the salt thoroughly with the snow, and reduce it almost to a liquid form. Street-sweeping machines are then sent out, assisted in some cases by men with scrapers and hand-brooms, and the melting snow is swept into the gutters. The sidewalks are not usually treated with salt, partly because of the annoyance which it causes to pedestrians, and partly because the abutting owners are, as here, obliged to clear their own sidewalks to a certain width. The idea that salt, mixed with the snow in the streets, is injurious to the feet of horses, seems to be quite unknown in Paris, although it is so generally accepted here that the placing of salt in the streets in snowy or icy weather, which was once extensively practised by the street-car companies, is now prohibited by law in many of our large cities. We remember a certain street-car company, which once brought itself into notoriety by its ingenious method of evading the law, which consisted in boring holes through the bottom of a car, and putting in two men, who lay down on the floor, with baskets of salt, concealed by the straw which was then used as a carpet in the cars, and dropped the salt through the holes. The agents of the Society for the Prevention of Cruelty to Animals, if we are not mistaken, first discovered the secret of these mysterious cars, which drove about empty, but would not stop to take passengers, and brought the violators of the law to justice; and since then the use of salt, except on switches, has become rare.

THE *Scientific American* says that a factory has been established in Worcester, Mass., for producing castings of wrought-iron, after the method introduced a year or two ago in Sweden, by Nordenfelt. Except for the fact that wrought-iron is infusible in any ordinary furnace, such castings would have been made long ago; but manufacturers, desiring to make strong and tough castings of iron, have hitherto had to content themselves with making them malleable after casting, by heating in boxes of hematite powder, or with employing cast-iron, "toughened" by dissolving in it, while fluid, small pieces of wrought scrap-iron. The introduction of naphtha-spray as a fuel for furnaces, has, however, now placed within reach of manufacturers a means of producing a temperature far above that of the old coal furnaces, and crucibles containing sixty or seventy pounds of pure wrought-iron can now be kept in a perfectly fluid condition. By using bars and scraps of the best wrought-iron for supplying the furnaces, castings are obtained as soft, strong and easily welded as forgings from the same iron, and much more homogeneous in texture, the castings, when broken, showing little of the fibrous character of forged iron. The wrought-iron castings are welded without difficulty to forged bars, and seem likely to become of great use in building and engineering work. Already elbows and fittings for wrought-iron pipe are made of this material, and a flexibility and strength secured which has been, until now, unattainable; and it cannot be long before lintels for short spans, connections for the different members of roof and bridge-trusses, as well as an almost infinite variety of articles of hardware and portions of machinery, will be furnished by the new process.

THE diminution of the population of Paris within the last four years only makes more prominent by contrast the extraordinary growth of the German cities during the same or a somewhat longer period. According to a paragraph which we find in the *Gaceta del Constructor*, while there were, thirty years ago, only four cities in Germany with a population of more than one hundred thousand, there are now twenty-five. Berlin has very nearly trebled in population since 1855; Dantzic, Stettin, Magdeburg, Hanover, Leipsic, Aix-la-Chapelle, and Nuremberg, have about doubled; Barmen, Elberfield, Altona and Stuttgart have trebled; Chemnitz, Düsseldorf and Crefeld have more than quadrupled, and Dortmund, which was, about thirty years ago, the remnant of an ancient walled town, with some rudimentary manufactories and a population of seventy-six hundred, has now become a great manufacturing city, with a population of more than a hundred thousand, and prospects as bright as those of any of our Northwestern cities. It would be an interesting study to learn the effects of this change in the habits of so large a part of the population of Germany. A generation ago the names of Stuttgart, Dresden, Frankfort-on-the-Main, Düsseldorf, and Nuremberg were synonyms for sleepy, antique-looking places, where living was cheap, and lodgings were more plenty than occupants; now every one of them has become a pushing, busy town, increasing in population at a rate more rapid than that of New York within the same period, and alive with speculation and business activity. The cause which has drawn so many of the German people from their country homes to the towns is believed by the Germans themselves to be in great part the establishment of the industrial schools, which are now flourishing in all the principal manufacturing cities. The establishment of the empire, and the centralization of the government, with its brilliant court, in Berlin, has probably had most influence in increasing the population of the capital; but Crefeld and Dortmund owe nothing to the attractions of a court, and it is undoubtedly true that their growth is directly due to the weaving schools, which have, within one or two decades, brought the textile industries of Germany from the verge of extinction to the highest pitch of prosperity, and have enabled German manufactories to place their goods on the counters of the Parisian retailers in successful competition with those of Lyons, and even of Paris itself, and to crowd out French fabrics, by the superiority of their processes, from the most important markets of the world.

MURAL PAINTING.[1] — IV.

THE WALL.



FROM the encaustic painting of the ancients, described in the preceding article, the passage to modern wax-painting seems easy and natural. In order that its description may be unbroken, the preliminary and very important questions of the wall and ground will be discussed in this paper, and the process of wax-painting in the succeeding one.

That the walls and their preparation[2] should be objects of the greatest solicitude to the painter is axiomatic. Even had I the practical knowledge, it would be presumptuous to dictate methods of construction to trained architects. I can merely as a painter recall to their attention one or two principles on the observance of which the vitality of mural painting depends. In this way their interest may be sufficiently aroused to practise what has so often been preached by far wiser men than I. To their indifference, or a misplaced confidence in others, we must attribute the cracked and shabby plastering, and peeling or disintegrated paint by which the majority of structures are disfigured.

Damp walls militate against mural painting of all sorts; they may be caused by: —

(1) Leakage from above.
(2) Ascension by capillary attraction from the soil.
(3) The presence of saltpetre.
(4) Condensation of moisture.
(5) Exposure of porous materials to extraordinary weather influences.

Naturally the cure for the first of these evils is to stop the leak; but it would be well, as Vitruvius recommends, to guard against any such contingency by protecting decorated ceilings with a water-proof stratum between the paintings and roof or floor above.

Experts say that the vertical ascension of moisture by capillary attraction from the soil has been far more injurious to frescoes than the horizontal penetration of damp through the perpendicular faces of the wall. To prevent the ascension of humidity various hydrofuges have been employed, such as a water-proof course of asphalt felt, or of sheet-lead covered on both sides with pitch at the third course above the level of the ground, or again, "a coating of liquid asphaltum laid on pretty thick, and very carefully, with a strong brush; this is then covered with coarse sand, and at the same level a projecting joint of hard asphaltum is laid to cut off completely the capillary communication of the moisture."[3]

The mystery of saltpetre, which is a frequent cause of wet walls, has hardly yet been solved. The presence of certain soluble alkalies that contribute to produce it is more frequent in some clays than in others. The lime and sand of the mortar, too, may contain its chemical constituents, which would be greedily imbibed by very porous bricks. Several preventives against the penetration of saltpetre into the plaster have been recommended: asphalt alone, or with linseed oil; resin, tarred-felt, etc. A hydrofuge of pitch and sand, to exclude damp and saltpetre from walls that are to be frescoed is an old Lombard recipe. "This composition was thrown like rough-cast against the wall, and thus afforded so strong a hold for the mortar laid on it, that in breaking through walls thus protected the mortar and hydrofuge have never been found to separate at their point of juncture."[4] But before any such application is made to the perpendicular surface of the wall, all ascension of damp from the soil must be checked by a water-proof course, if possible.

The condensation of moisture on cold walls is a source of danger to mural paintings. The outer walls are chiefly exposed to this precipitation of water. Ashlar walls are more liable to it than brick. A double or furred wall would probably be free from it.

Storm-exposed walls may prove conductors of damp, unless protected; but whether they be coated with paint or a vitreous glaze, or boarding, they must first be thoroughly dried and guaranteed from ascending moisture; otherwise the damp will be driven inwards. Paint applied externally is very short-lived. Unless the walls be much exposed, it is far better to apply the protecting coat on the inside.

For stone walls that are to be painted, perhaps the most efficient hydrofuge is the encaustic process. The construction of walls cannot always be controlled, or the painter may be called upon to decorate an old stone wall — of a church, for instance — to which neither furring nor pitch may be applied. Then a coat of wax and oil, or the like, well burnt in, is to be recommended.

In the year 1811 Gros was commissioned by the first Napoleon to paint the dome of the Panthéon. To quote his own words, he agreed "to represent on it — the figures being to the scale of four metres — a glory of angels bearing to heaven the shrine of St. Geneviève; below, Clovis and Clothilde his wife, founders of the first church; farther on, Charlemagne, St. Louis; and, on the opposite side, His Majesty the Emperor and Her Majesty the Empress consecrating the new church to the worship of that saint. I ask for this work the sum of thirty-six thousand francs, which is to be paid me in three instalments; to wit, twelve thousand francs on the completion of my composition and its approval by your excellency [Chevalier Denon, Director General of the Museum Napoleon] and when I am ready to paint; twelve thousand francs when my work is three-fourths done, and the last twelve thousand francs when, on the removal of the scaffold, it is open to inspection."[5]

As a preparatory measure, the interior surface of the stone was first treated with a coat of size, upon which was laid another of white lead and drying-oil. Gros did not place confidence in this preparation, and a special commission was appointed to provide a suitable ground. The commissioners were MM. Thénard and Darcet, the most eminent chemists of the day. "After making some experiments not requisite to be noticed here, they gave the preference to a composition of one part wax and three parts linseed oil, boiled with one-tenth its weight of litharge. The absorption took place readily by means of heat, and the liquid penetrated the experimental stone to the depth of a quarter of an inch. The composition, as it cooled, acquired solidity, and in from six to eight weeks it became hard." The same process was adopted for the cupola. "By means of a portable furnace the whole superficies was heated in successive portions (about a square yard at each heating) by moving-on the *cauterium* (furnace) horizontally, parallel to the wall, as such part became sufficiently heated, and then the composition was applied with strong brushes, when the stone was at a temperature of one hundred degrees. The first application having been quickly absorbed, others were repeated until the stone ceased to absorb, and as it was rather porous, it required the heating to be repeated oftener than would have been necessary for a stone of a closer texture; and in these heatings care was taken that they should not be so strong as to carbonize the oil. At length, the stone having refused to absorb any more *mastic* [composition,] and the surface which it covered being soon cool, smooth and dry, it received a coat of white lead and oil well ground together, and it was upon this preparation that the groundwork of the distinguished artist, Gros, was painted."[6] From various indications I should infer that these decorations were executed in an oil medium, although there is no direct statement to that effect. Owing to conflicting statements as to their present condition, I wrote to a friend in Paris for accurate information. The answer, just received, is that "they are as fresh as if painted yesterday;" though the joints in the masonry tell as dark lines here and there when viewed very near. The paint in these places seems "to be stained, not cracked or peeled."

The decorations shared the dynastic vicissitudes of the epoch. On the 10th of August, 1814, Louis XVIII was substituted for Napoleon, the price being raised to fifty thousand francs. On the 31st of March, 1815, Napoleon was reinstated, and finally Louis XVIII was again restored, pictorially as well as politically. During these changes Gros writes in a semi-frantic state to the minister (16 April, 1815) that unless he can command "the tranquility of a definite work," he "will be obliged to fall back on portraiture, sorry resource of our art and the shoal of artists called to noble undertakings." On the completion of the painting in 1824, Gros was created a baron. It has seemed worth while to describe at some length the conditions under which this decoration was painted, seeing that the evidence (by which the conduct of similar undertakings may be guided) is incontestable, and that it has already stood the test of over half a century. Moreover, the unnecessary and premature decay of William M. Hunt's mural work in the Capitol at Albany, executed less than ten years ago, has appalled every one interested in monumental painting, and cast a certain discredit on this noble art. Perhaps the foregoing description may serve as an antidote. MM. Thénard and Darcet recommend their composition (the wax, oil and litharge) for the preparation of stucco on ceilings. It penetrates the stucco deeply, renders it as hard as stone, and effectually wards off damp.

When walls are constructed with a view to subsequent decoration, all pigment-destroying agencies can be eliminated. A double wall, with an air-space between, is a safe foundation for mural painting of all kinds, provided that the air-space be well ventilated, and the bondings damp-proof. The inner wall at least should be brick, but not very soft or porous brick, from which plaster is liable to fall, as it yields its water of hydration too quickly, even though the bricks be thoroughly drenched before the plaster is "rendered." If the paintings are not to be in "fresco" — which, as we shall see later, calls for a backing of brick — iron lathing would probably be the safest foundation. The wall behind the ironwork should be solid and dry, and if double, so much the better. Furring and lathing of

[1] Continued from page 53, No. 527.

[2] Three excellent papers have appeared in these columns, by Charles T. Davis, entitled "Saltpetre Exudations upon Brickwork," I and II, [Nos. 462 and 467. Vol. XVI.], and "Hints on Plastering" [No. 488, Vol. XVII.]. There is another interesting paper from the *Builder*, entitled "Damp Walls" [*American Architect.* No. 372, Vol. XIII.]

[3] M. Polonceau's method, quoted from "*A Manual of Fresco and Encaustic Painting*," by W. B. Sarsfield Taylor, London: 1843.

[4] W. B. Sarsfield Taylor.

[5] *Les Decorations du Panthéon* (troisième article), par M. le Marquis Ph. de Chennevières. *Gazette des Beaux-Arts*, T. XXIII, L. 284. 2d période.

[6] Taylor.

wood are not reliable. Wattled reeds are recommended by Vitruvius to prevent cracks, and they are still used in Germany and Italy. Architects should familiarize themselves with the mysteries of plaster. No all-embracing rule can be formulated, owing to the varying properties of local ingredients; but these should be thoroughly mastered. Much of the rotten and defaced plastering is undoubtedly due to bad walls and settling foundations; but a great deal is also attributable to an inferior quality of plaster and to hasty methods of applying it. We know that our plaster, as a whole, is wretched, while that of a people who flourished some two thousand years ago (the Romans) was, and one might almost say *is*, excellent. The latter carefully applied many coats of a superior compound, while we hastily lay on but half the number of an inferior one.

Of late years so many constructive improvements and appliances have been invented, that it is astounding to see the same old defective methods of plastering in vogue. Apparently "common lath-and-plaster still wins nine times out of ten." For "*buon fresco*" plaster is a necessity, but *buon fresco* is a process rarely used by American decorators. Why, then, has not plaster long since been banished from first-class buildings, and its place supplied by some reliable cement? Where the need is felt, the thing needed is generally forthcoming. If reliance is to be placed on an article that recently appeared in these columns (Vol. xviii., No. 502), "Robinson's cement" would seem to be a good substitute for plaster. Its use would do away with the "pit" and all the clumsy appliances of the plasterer. The time occupied in slaking the lime and drying the successive coats would be saved. The rendering coat, mixed with sand, sets at once, and the finishing coat, with or without sand, may be applied directly, forming a homogeneous body that is very hard at the end of a few hours. It has "excellent fire-proof qualities," and "has been carefully tested for painting in several ways by a well-known London decorator, and with entirely satisfactory results, showing that it can be applied and painted upon at once, as with Keene's or Parian, or it may be left to get dry, and then painted, as within three weeks of being rendered it is thoroughly dry and ready for decoration, and will stand fine colors perfectly. With other cements, if left, the period that must elapse before they can be painted must be measured by months instead of weeks. In using it no notice need be taken of the time of year or the state of the weather." This cement can be manufactured at much less cost than any of the others. The principal cement-works of the patentees, Messrs. Joseph Robinson & Co., "are situated at Kenthill, near Carlisle (England), where they have immense deposits of the purest alabaster."[1]

Another cement worthy of notice (doubtless there are others) is the Merrit Asbestine Plaster, which has the advantage of being manufactured in this country. It is unnecessary to dilate here on its fire-proof qualities. Though not absolutely water-proof, it is vastly more so than ordinary plaster. It is made from asbestine, a mineral containing over ninety per cent of silicate of magnesium, with a small proportion of aluminum, iron and water. This is ground to a fine powder, and then mixed with caustic potash and silicate of soda. When needed for use, it is mixed with sand. It hardens in a few days to the consistency of stone, and is very adhesive, adhering even to plate-glass. Instead of a wood or wire-lathing, thin corrugated sheet-iron plates are used, nailed to ordinary, or fire-proof, furrings of pulp. The corrugations are very close, and only one-eighth of an inch deep. Of course, the plaster could be applied directly to the wall. I saw a specimen of it spread on a thin board that had warped considerably, but the plaster had not cracked. Its expense is not much, if any, greater than ordinary plaster, taking time and labor into consideration. Of its excellence as a ground for painting it is impossible yet to speak with certainty. Time alone can decide the question, notwithstanding all "claims." Several decorators have experimented on it with perfect success, first having given it a coat of suitable size.[2] It must be borne in mind, however, that some cements are liable eventually to effloresce, and act chemically on the colors. While on this particular cement, the colors might, and probably would, stand long enough for all practical purposes, could they be guaranteed for an important mural composition that is expected to last? Professor Lewis M. Norton, of the Massachusetts Institute of Technology, to whom I am indebted for much valuable information, while heartily praising the fire-proof qualities of this plaster, shared my doubts as to the durability of any superposed pigments. He feared efflorescence and chemical action. Of course, these fears might never be realized. I have written at some length of these cements, hoping that good might come of it. The deplorable state of our plastering will, I trust, justify my prolixity.

A painter is frequently required to decorate an existing but unreliable plaster wall. When the space to be decorated is not very large the safest way is to fasten artists' canvas to it with a composition to be specified hereafter. This is a somewhat expensive method, yet worth while when the picture to be painted is valuable; not only because it ensures the painting against plaster-cracks; but also for the reason that it can be more readily detached in case of need. Canvas, moreover, is innocuous to the superposed colors; lime is not always so, unless well covered with several preparatory coats of paint. Lime saponifies oil, which quickly turns yellow in the absence of strong light. For oil paintings the regular prepared canvas as sold by colormen is suitable, but for wax-painting the unprepared material is preferable. When comparatively large surfaces are to be covered, the unprepared canvas is better even for oil painting, as it can be attached to the wall more easily and securely, the composition penetrating its meshes. The only advantage of prepared canvas is that it can be painted upon at once. The composition is apt to percolate through the meshes of the raw stuff, and should be given time to dry. It is difficult to procure wide pieces of unprepared canvas in this country. A few years ago the widest in the French market was about four metres; a greater width being desired, the canvas must be pieced. But when the wall-space to be covered is very great, this method is usually abandoned. Linen canvas is better than cotton. To fasten it to the wall demands care and patience. Trusting too much to the readiness of inexperienced artisans, I have undergone several mortifying and costly experiences. Like the making of good coffee it seems so simple and easy that almost any neophyte is willing to guarantee success. Such however, is not the case. There may be those who have succeeded with glue or paste; I have not. Blisters invariably appeared on the following day, when the prepared canvas was used for large spaces, and even the unprepared behaved badly. Small spaces present no great difficulties. It must be remembered that glue does not resist moisture. The following composition has not belied its recommendation: —

70 lbs. white lead.
2 qts. boiled oil.
1 pt. dammar varnish.
1 pt. Japan.

Doubtless other ingredients or proportions might be used; but the basis should be white lead. An unpainted wall needs a priming coat. (It would not be unwise where there is danger of damp to precede the priming coat with an encaustic or cold-wax treatment). Then a very heavy coat of the composition should be laid on with broad, flat brushes and the raw canvas immediately applied. When this is large four or five men, at least, are needed. It should afterwards be rolled (with rollers) and smoothed with the hands for hours till it is perfectly flat. This operation exacts patience. When prepared canvas is used, a coat of the composition should be laid on the back immediately before its application to the wall. In either case the edges should be nailed, or fastened with a moulding.

It is a frequent custom to attach the canvases to a "keyed" stretcher, and then fasten it to the wall with mouldings. This is not a good method, unless the canvases are small, and the mouldings easily removed to "key up" the stretchers. Canvases are in a way barometers, shrinking or expanding according to the dryness or humidity of the atmosphere. It is almost impossible to prevent the "bellying" of stretched canvas, placed against a cold wall in damp weather, and this appearance of flabbiness is very unpleasant. The use of stretchers is undoubtedly due to the habit of painting mural pictures in the studio, a convenient and fatigue-saving habit, but antagonistic to scholarly decoration. Not only does it obtain to-day with good artists, but with the very best, and I should have great hesitancy in condemning it were I not backed by the demi-gods of the wall, when mural painting was at its zenith. The great virtue of monumental paintings lies in their harmonious relations to their surroundings. The conditions of light and shade are far too complex to be divined by the most skilful and experienced. The freaks that distance, altitude, or curvature of surface play with lines, utterly baffle human prescience. When it is considered that color is an entirely relative quality, how can its settings—settings that change with changing light—be ignored? or rather how can they be imagined in the foreign environments of the studio? On merely sentimental grounds (which are never very sure foundations it must be confessed) it seems inartistic to paint mural pictures in the studio. The studies and cartoons must necessarily be prepared in it. There is something stimulating in the expectant wall; and when that wall is vast and imposing, as it often is in church or hall, it is absolutely inspiring! Nothing is more difficult or compromising than to raise the key or change the tonality of a picture; yet studio-painted decorations must frequently be subjected to such ultra measures, or else discord with their surroundings. How tasteless to paint a ceiling in the studio, and then

[1] *American Architect*, Vol. XVIII, No. 502.

[2] Since writing the above paragraphs on the Robinson and Merrit cements (which I prefer to leave unchanged, in the hope of stimulating the ingenious), I have conferred with Professor T. M. Clark, Professor of Architecture, Mass. Inst. of Technology. He distrusts silicate of soda, which he thinks is almost certain to cause efflorescence. Of cements in general, he writes: "I don't think any cement would be very favorable for painting, at least without particular treatment. Mixing with sand would give it key enough for paint, but there is usually more or less of an efflorescence, much slighter than that caused by silicate of soda, but which, in my experience, works under the film of paint and separates it, especially if the back of the work is exposed to any dampness. The only remedy I have ever found for this is to mix a large proportion of oil with the cement before putting it on. This nearly or quite stops the efflorescence, and might make the cement good for painting on, but very little is known about this part of the subject." Again, he writes: "Keene's cement is smooth and hard, something like plaster-of-Paris, but harder and less absorbent. I have never seen any indication of efflorescence on it which seemed to come from the cement itself. Keene's cement is rather disposed to crack. There is a process of crystallization which goes on for years in cement of the ordinary kind, and the blue efflorescence may be a product of this."

Keene's cement was used by Messrs. Sturgis & Brigham in the Boston Museum of Fine Arts for the architraves and baseboards. It has cracked in some places, and effloresced in others, where the wall is damp. Mr. Sturgis says of it: "Beware of dampness." Robert Jackson, an Englishman, (and late manager for Mr. Sturgis), who has had a large experience with Keene's cement both in England and America, would trust it as a ground for mural painting. He says that it should receive its first coat of paint before it has set. This coat should contain no lead, and the paint should be diluted in a liquid composed of three parts turpentine, one part boiled oil, with a small quantity of litharge. Owing to a disregard of these rules, the paint has often deteriorated. No oil is to be mixed with the cement. He preferred Keene's to the other cements, though he did not know from experience anything about Robinson's.

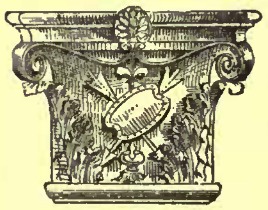
Professor Clark thinks with me, that our plaster and methods of plastering could be greatly bettered, as will be shown in a subsequent paper.

exhibit it on the perpendicular walls of an exhibition-room, yet this is done! On mechanical grounds there are objections to studio-painted decorations; the attachment of canvases to the wall has already been described, and it can easily be imagined that there is great danger of percolation of white-lead through the meshes of the canvas, in places where the picture may be thinly painted. Such a contingency must be guarded against by a very heavily-painted ground; but at best the rolling and unrolling of large pictures, and excessive handling demanded by the white-lead process, are very compromising.

There is a class of pictures that may be confounded with, yet are not properly mural paintings. Such, for instance, are the altar-pieces, of which so many were painted by the great decorators. It was desirable that they should be movable; hence they must be regarded as easel pictures, and consequently not within the scope of this article. FREDERIC CROWNINSHIELD.

[To be continued.]

THE ARCHITECTURAL DRAWINGS AT THE EXHIBITION OF THE SALMAGUNDI CLUB.[1] — II.



BESIDE the red railway-station is a cluster of color sketches. The first of these, No. 80, by Mr. C. H. Walker, is a lovely bit of color, showing a doorway in Seville, decorated with tiles, or something of the kind. As in some others of Mr. Walker's sketches, the brilliant coloring of the little spot which marks the decorated door contrasts too strongly with the slightness of execution of the rest of the sketch, but the whole has a truthful air which goes far to excuse its lack of keeping. Near this are three small sketches, by Messrs. Longfellow, H. L. Warren, of Boston, and Shope of New York, which are very differently treated, being so highly finished all over as to lose, in their turn, much of the freshness which makes a good color sketch so precious. Both Mr. Shope and Mr. Warren have other sketches in the exhibition, Nos. 102 for Mr. Shope, and 139 for Mr. Warren, which are less labored, and therefore much better; No. 139, in particular, being one of the best sketches shown. The introduction of so many sketches from nature into the exhibition was a happy thought of the managers. Although in themselves mostly small and unimportant, they give a pleasant relief from the rather forced and artificial rendering of the show perspectives, and to one who wishes to judge of these critically they serve as an ever-present standard of natural effect which is valuable. Among the most forced and theatrical among what we might call the commercial drawings on the walls is a perspective of Mr. Robertson's Madison Avenue Methodist Church, No. 86, colored, we suppose, by Mr. Hughson Hawley, in which the attention which the design alone would hardly attract is compelled, by clothing it in an atmospheric effect which seems to be intended to represent moonlight on a stormy night, with a dose of thunder-cloud and sunset added, to suit it to all tastes. Another colored drawing of the same church, No. 130, which does not seem to the artist to have needed so much seasoning, is far more agreeable. Near the Robertson church is a drawing in black and white, No. 88, of a house in Pennsylvania, by Mr. T. P. Chandler, Jr., which, in its own way, errs by the same sort of obtrusive theatricalism as its more pretentious neighbor, and is, if anything, more unpleasant in its monotonous succession of blotty shadows, scrawly textures and broad, blank white spaces. There are better things of Mr. Chandler's here, but most of them show a weak, black, scrawly mannerism which sorely needs correction by comparison with some of his own beautiful published work of eight or ten years ago, or with such sweet, loving little pictures as Mr. Sargent has made, No. 90, of his own charming rectory, not "refectory," as the blundering catalogue calls it, at Fordham.

The next drawing of special interest which we come to is a finished water-color sketch of the clock tower at Dinan, by Mr. Robert Swain Gifford, which we suppose must, with two others of the Mosque at Tlemcen, by the same renowned artist, have strayed from their proper places in the Salmagundi rooms, or the National Academy close by, into the uncongenial society of so many works by inexperienced, not to say ignorant amateurs. Having, however, been caught in such company, they are obliged to submit to criticism with the rest, and architects will probably take pride in observing that the works of themselves or their fellows do not appear wholly at a disadvantage in comparison with those of the brilliant professional artist. Although Mr. Gifford makes much more of a picture out of his subject and its surroundings than any of the architects would, his towers, considered as representations of buildings, are less successful than those of Mr. Walker or Mr. Warren. Like the buildings depicted by most painters, they are disintegrated, spotty and minute, and although aided by various tricks of composition, they lack the solidity which an architect sketcher would have known at once how to give them by contrasts of broad washes of color. Near the Dinan clock-tower is a rather surprising design for the New York Athletic Club, by Mr. H. Edwards-Ficken, inadequately shown in a brown-ink drawing; and close to this is a pretty sketch by Mr. Blackall, in brown-ink with slight washes in color, of a little scene in Barcelona. Well managed, brown-ink is an excellent medium, but one cannot avoid noting, in comparing these two drawings, the shortcomings by which it often disappoints those who use it too faithfully. Mr. Ficken's sketch, being small in scale, is necessarily drawn in slender lines, and without any of that slobbering, so to speak, of ink in the shadows, which can be indulged in with the happiest effect where the scale is large and a sketchy manner is permissible. The inevitable consequence is that the drawing, as compared with what it would have been with black ink, is weak and unsatisfactory, while Mr. Blackall's, needing only a few broad strokes and dots, is just strong enough, and not too strong, as it would have been if he had used black ink in the same way. Mr. Richardson's cathedral drawings, which are in brown-ink, are just about large enough in scale to bear the wide lines which are absolutely necessary to get effect; and even with these it is questionable whether an ink of somewhat stronger color, such as Prout's brown or liquid sepia, would not have exhibited his design to better advantage.

After some dauby studies of decoration on tracing-paper, by Mr. H. Edgar Hartwell, come two more Philadelphia sketches, in Indian ink, one, No. 119, by Mr. Wilson Eyre, Jr., and the other, No. 107, by Mr. T. P. Chandler, Jr. Both of them are good, and the latter is far superior to the pen-and-ink drawings shown with it. Near these are two very large, but rather cold, colored drawings, Nos. 116 and 134, of a house in Virginia, by Messrs. Cabot & Chandler, of Boston, and an excellent drawing of a city house by Mr. R. H. Robertson. Close to this is a frame of sketches of furniture, by Mr. F. H. Bacon, which deserve attentive study. Mr. Bacon is one of the most brilliant pen-and-ink draughtsmen in the country, and, although his furniture sketches are very simple, and present no great interest as designs, being mainly combination of old details, the precision, effectiveness and economy of line with which they are rendered can hardly be too highly praised. In No. 136, we find a clever design and drawing in pen-and-ink of a house by the Schweinfurth Brothers, of Cleveland, and near it is another pretty brown-ink or sepia sketch by Rossiter & Wright. Interpolated about here are some water-color paintings on sale, one being by Mr. F. Hopkinson Smith, of New York, one representing a "French town," and one or two others by Mr. H. B. Warren, of Boston. For one of these the modest price of one hundred and seventy-five dollars is asked, and another in sepia, less interesting than many of the architects' drawings near by, is priced at fifty dollars, while a third in Indian ink, which our memorandum characterizes as "poor," is held at the same figure. We must confess that we are sorry to see these pictures hung among the architectural drawings; not that they injure, by contrast, the effect of the latter, for it is rather themselves that suffer by the comparison; but because a picture is, or should be, one thing, and an architectural drawing another, and those who claim to be able to paint pictures make a better appearance, on such occasions, as contestants for public appreciation among their fellows and equals, and not among amateurs of a different profession.

We must hurry through our task, and omit mention, perhaps, of some excellent drawings, to reach more quickly those presenting special interest of some kind. Three of the latter we find nearly side by side. One of these is a breezy but highly-finished color sketch (No. 178), of the Jefferson-Market Court-House in New York, by Mr. Beverly Robinson, whom we take to be identical with Mr. John Beverly Robinson, who figures in the catalogue as the author of a much less successful monochrome sketch of an interior, placed elsewhere. This drawing has the air of being painted directly from nature, so fresh is it, and so true in its values of sky, and shade, and color. The next of the trio is a frame of small sketches, No. 179, with color slightly indicated, by Mr. Peabody, of Boston. Small as they are, they are singularly interesting in design, and clever and effective in execution, although perhaps a trifle thin, compared with their full-colored neighbors, particularly with No. 183, a doleful-looking drawing in Payne's gray or indigo, of Sansovino's tomb of Cardinal Sforza at Rome, by Mr. Blackall. As a drawing, it is admirable; the shadows are laid with a precision which is beyond praise, and the modelling almost projects from the paper; but the color is so chilling that one longs to disturb it by a friendly grease-spot, or some other evidence of human presence. Near this Mr. Stevens, of Portland, and Messrs. Bronner and Tryon, of New York, have some interesting and effective pen-and-ink drawings; and Mr. R. W. Gibson shows some splendidly-executed pen drawings of various parts of his Albany cathedral. Mr. Haight, Mr. Bruce Brice, Mr. Upjohn and Mr. Pfeiffer, of New York; Messrs. E. M. Wheelwright and Rotch & Tilden of Boston; Mr. Gifford of Newark, N. J.; and Mr. Harney and Messrs. Rossiter & Wright, of New York, enliven the wall-space next succeeding with clever pen-sketches, beside which are two colored drawings, one, No. 222, by Messrs. Cabot & Chandler, of Boston, showing a very pretty small interior, and the other, No. 226, by Mr. W. R. Emerson, of Boston, a study of a rambling red house, almost buried in summer foliage, which to our mind is, without exception, the most beautiful piece of work in the whole collection. Every architect knows Mr. Emerson's pencil sketches, and remembers the picturesqueness with which he manages to fill those unapproachable compositions; but a colored drawing bearing his name is a novelty. We cannot say certainly whether the rendering is wholly from his hand or not, but whoever did it has known not only how to retain all the picturesqueness of a thoroughly characteristic design, but to intensify it, at the same time that he clothed it with the tenderness and feeling that only color laid by a master-hand can give. Anything more full of artistic sentiment it would be hard to conceive, and we

[1] Continued from No. 527, page 54.

may all be proud that such a charming work should close the American portion of the collection hung on the walls of the gallery.

The next number, passing over two well-executed drawings in pen-and-ink by Messrs. Gifford, of Newark, N. J., and Harney, of New York, is 232, a pen-sketch of St. Mary's Church, Monmouth, by the late George Edmund Street. Although a little disappointing, as compared with what one recollects of the dashing drawings of Street's later years, they are admirably executed, and only a little less interesting than one of Mr. R. Norman Shaw's unrivalled pen-and-ink drawings, a country house for the artist Goodall. Every one knows Mr. Norman Shaw's drawings, from the reproductions in the English architectural journals, and it is only necessary to say that this particular one has all the effectiveness, combined with perfect finish, of his best work. Near these are two of Mr. Ernest George's most interesting drawings, both in brown-ink. To our mind Mr. George's drawings look better in black, as reproduced, than in the original, brown, which, even in the best hands, is almost sure to be found wanting just at the critical point where a spot of deep color, or an intense shadow, is necessary to give roundness and force to the drawing; but the designs are as charming as possible. A characteristic, but remarkably good drawing of one of James Brooks's massive churches completes the list of English works, to which should, perhaps, be added an elevation, rendered in quiet tints in the French manner, of Mr. R. Phené Spiers's competitive design for the Church of the Sacred Heart in Paris, which is familiar to the possessors of old files of the *Croquis*.

As we leave the gallery, we bethink ourselves to descend the left-hand stairway, and find upon it a little collection of drawings over which we linger long. Some frames of pretty drawings by Mr. Wheelwright, Mr. Mead, Mr. Bacon and Mr. Warren of Boston, and Mr. Gibson, of New York, first claim our attention, and from them we turn with interest and curiosity to several large pen-and-ink sketches by Mr. H. P. Kirby, of Allegheny, Pennsylvania. The sketches are in line, and, although far too slight for their size, are delightful, not only for the precision and feeling with which they are executed, but still more for the architectural sentiment with which they are filled to overflowing. Of all the young architects of the country, Mr. Kirby, as it seems to us, thinks most naturally in architectural forms, and picturesque sky-lines and well-composed wall-surfaces run from his pen apparently without effort. Some of the cleverest of the drawings are imaginary sketches, in the the old town of Délabrement, for instance, and are charming in the inventiveness and architectural feeling with which they are composed.

We ought not to conclude our notice of the exhibition without referring with gratitude to the important aid given to it by the *Century* Company and the managers of the *Sanitary Engineer* and the *American Architect*, who have lent many of the drawings made for them of interesting and important buildings. Indeed, if it were not for the *Century* Company, some of the best architectural draughtsmen in the country, such as Mr. McKim, Mr. White and Mr. Babb, of New York and Mr. Van Brunt, of Boston, would be wholly unrepresented. Even with this help the work of many distinguished members of the profession is conspicuous by its absence, and we trust that the next exhibition, which, if we divine rightly the purposes of the gentlemen who directed this one, will take place next year, will enlist the coöperation of all those who are willing to show their own best work, or who would like to profit by studying the work of others.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

DESIGNS FOR WROUGHT-IRON WORK.

These bits of ornamental iron-work, designed by different architects of Philadelphia, were submitted for execution to the Manly & Cooper Manufacturing Co., of that city, through whose agency in the matter the present contribution to our illustrations is made.

THE PAROCHIAL CHURCH, LAGOS, MEXICO.

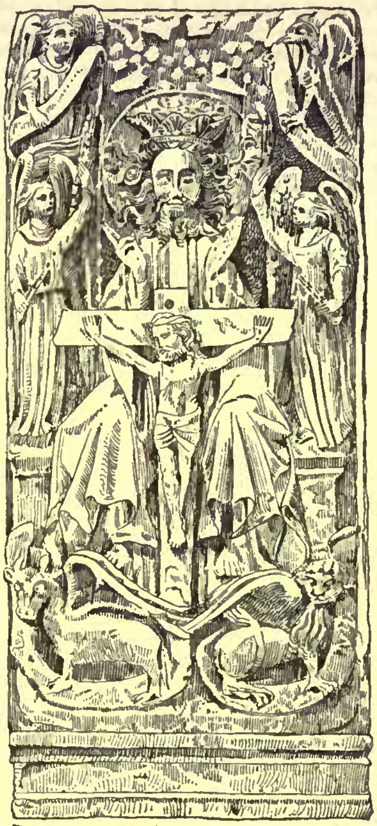
For description of this building our readers must turn to Mr. Baxter's "Strolls about Mexico," elsewhere in this issue.

COMPETITIVE DESIGN FOR THE COURT-HOUSE, TORONTO, CANADA. MR. C. S. LUCE, ARCHITECT, NEW YORK, N. Y.

True to its Name. — A curious instance of the effect of weather changes on woodwork is given by a writer in *Symons's Meteorological Journal.* The subject was a weather-cock, which was mounted on a long wooden pole. When the writer examined the four arms bearing the letters indicating the directions, he found it nearly forty-five degrees wrong, and on looking closer, he found that this was due to the warping of the wood of the staff. From top to bottom the pole was marked with innumerable small weather-cracks running parallel to each other, and around the pole in a slow spiral. It was evidently the twisting of the pole by these that had such a disastrous effect on the veracity of the vane.

STROLLS ABOUT MEXICO.[1] — X.

FROM GUANAJUATO TO LAGOS.



Bas-relief. Ch. S. Ouen. 15th Cent. Pont-Audemer. France.

We leave Guanajuato regretfully and with the determination to visit it again, equipped with a first-class camera with which to bring away a few dozen of the many hundred of superb pictures presented by the quaint and historic old city, which played a leading part in the beginnings of the struggle of Mexico for independence. Mr. W. H. Jackson, of Denver, in a visit of a few hours, with his quick eye for the picturesque, took a number of remarkably fine views, one of which I remember particularly — a strong foreground on the mountain-side, a group of organ cactus shooting up in the centre, out of a tangle of century-plants and prickly-pear, the city spreading away and filling the depths; the mountains rising grandly in the distance, and receding in a delicious aerial perspective in which the delightful mining-villages on the slopes showed vaguely, and not with the brilliant vividness of color and distinct outline conveyed by nature itself — even the best of cameras not yet being able to accord wholly with our own optical impressions. My friend Mr. Howard R. Butler, a young artist of New York, made some fascinating water-color sketches in the course of a day in the town, and sighed for the opportunity to spend months there, revelling in the scenic riches of the place. Unfortunately, I had but a few plates with me at the time of my visit, and through some perverseness of my camera the views did not come out well. I was glad, however, to get even an unsatisfactory reproduction of one delightful bit looking down a narrow lane through a steep gorge, a parapeted wall separating the thoroughfare from the dry ravine, spanned by the dark arch of a bridge; irregular buildings on the left, artistically-grouped and costumed loungers standing about, donkeys coming up from below, and the great church of La Compañia (the society of Jesuits, now expelled from Mexico), looming up with its stately new dome out of the valley in the distance. It was a characteristic piece of Guanajuato.

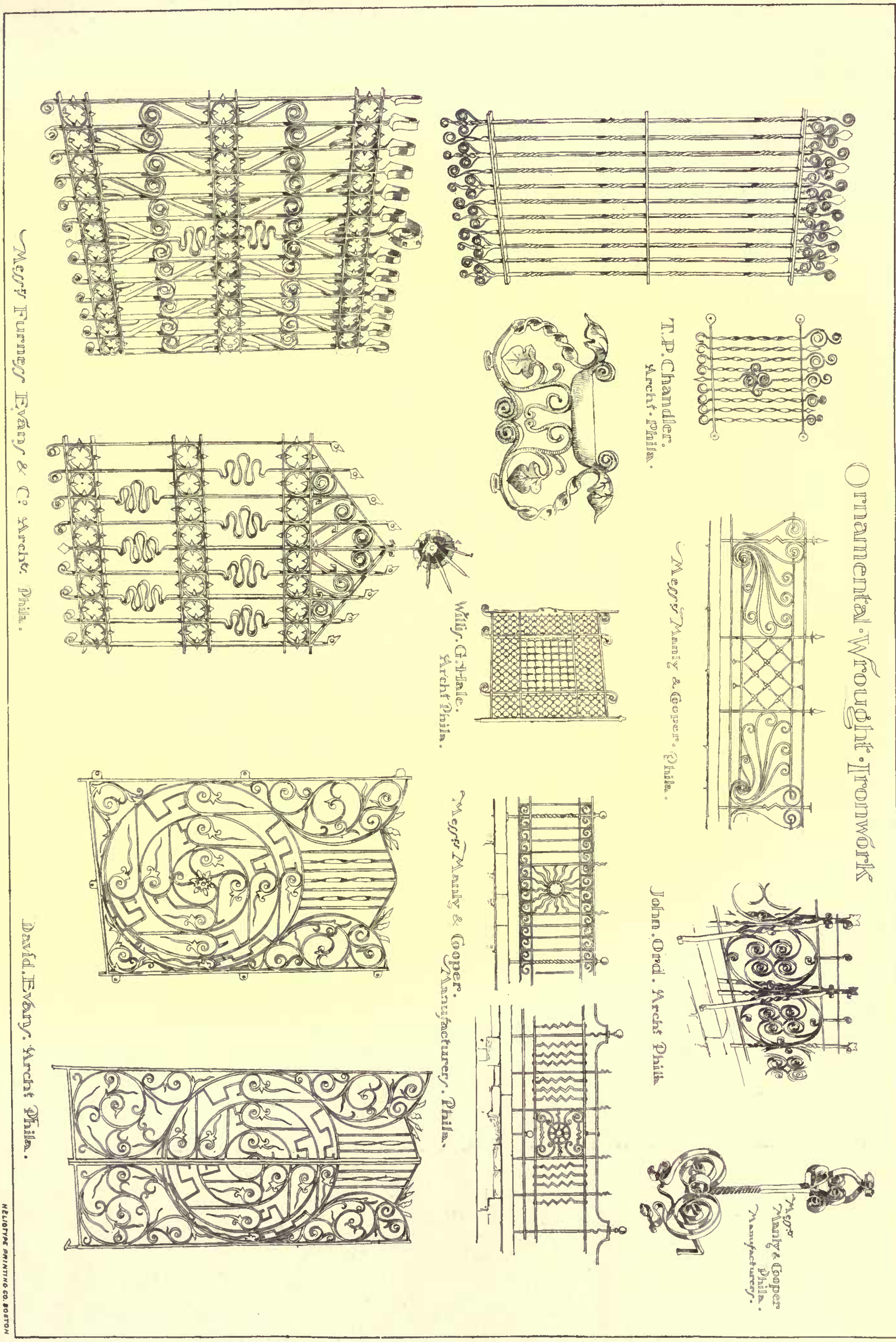
The stream that runs down through the heart of the city is a raging torrent at times in the wet season, but usually it is the meagerest thread of water, discolored and thick with the refuse from the hundreds of reduction-works that border it. These works have great court-yards for the manipulation of the finely pulverized ore, mixed with water and spread over the ground in a thick bed where it is trodden for weeks under the feet of mules and horses driven about over it. After this tedious kneading the silver and gold are extracted by chemical processes. Many of these reduction-works are owned by the shareholders in the mines, and when the mine itself does not happen to be paying directly, as in the case of the great Valenciana, which at present is, as a mine, run at a loss, nevertheless they still make a handsome profit by having the ore taken out treated at their own reduction-works. The reduction-works are no exceptions to the general rule of picturesqueness, with their massive buttressed walls, steep roofs, and arched aqueducts.

The run from Guanajuato, or rather from its suburb, of Marfil, where the railway ends, down to Silao, reminds me somewhat of the passage over the branch-line from Santa Fé in New Mexico down to the main line of the Atchison, Topeka, & Santa Fé Railway, with the difference that, in the place of the insignificant little junction station of Lamy, with a watering-tank and three or four little adobe huts, we have an important and rapidly-growing city, Silao being the headquarters of a railway division, and the point where the trade for Guanajuato now concentrates. As the northward-bound train draws out of the station and passes the city we notice the rare feature, for Mexico, of an attempt at Gothic in the spire and dome-cupola of one of the several churches of the place, and a pretty poor attempt it is, for Mexican architects are not used to handling the Gothic, having neither example nor precept to guide them.

The most impressive piece of Gothic which I have seen in Mexico is the new façade and tower of the parochial church at San Miguel

[1] Continued from page 17, No. 524.

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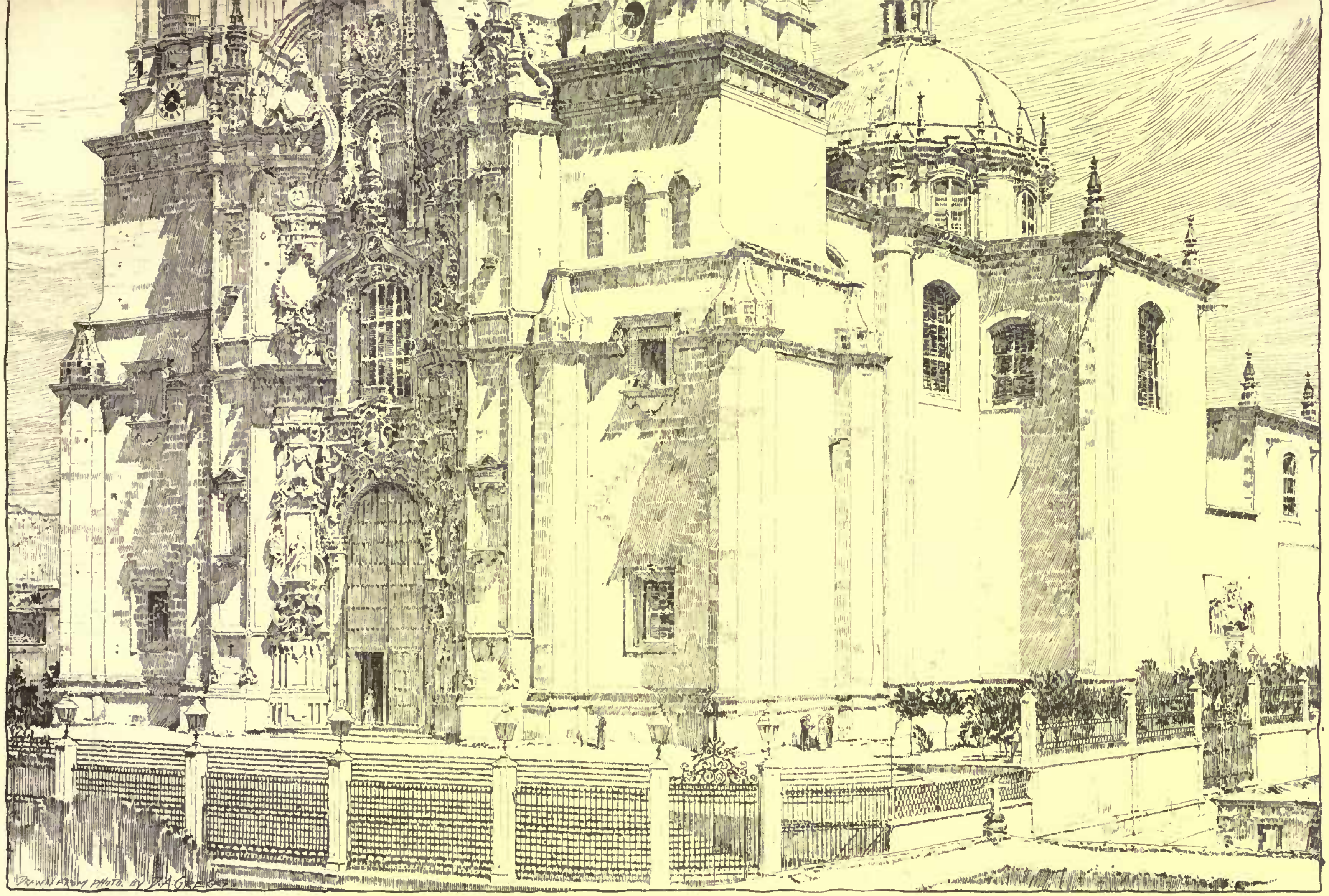


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PAROCHIAL CHURCH AT LAGOS, MEXICO.

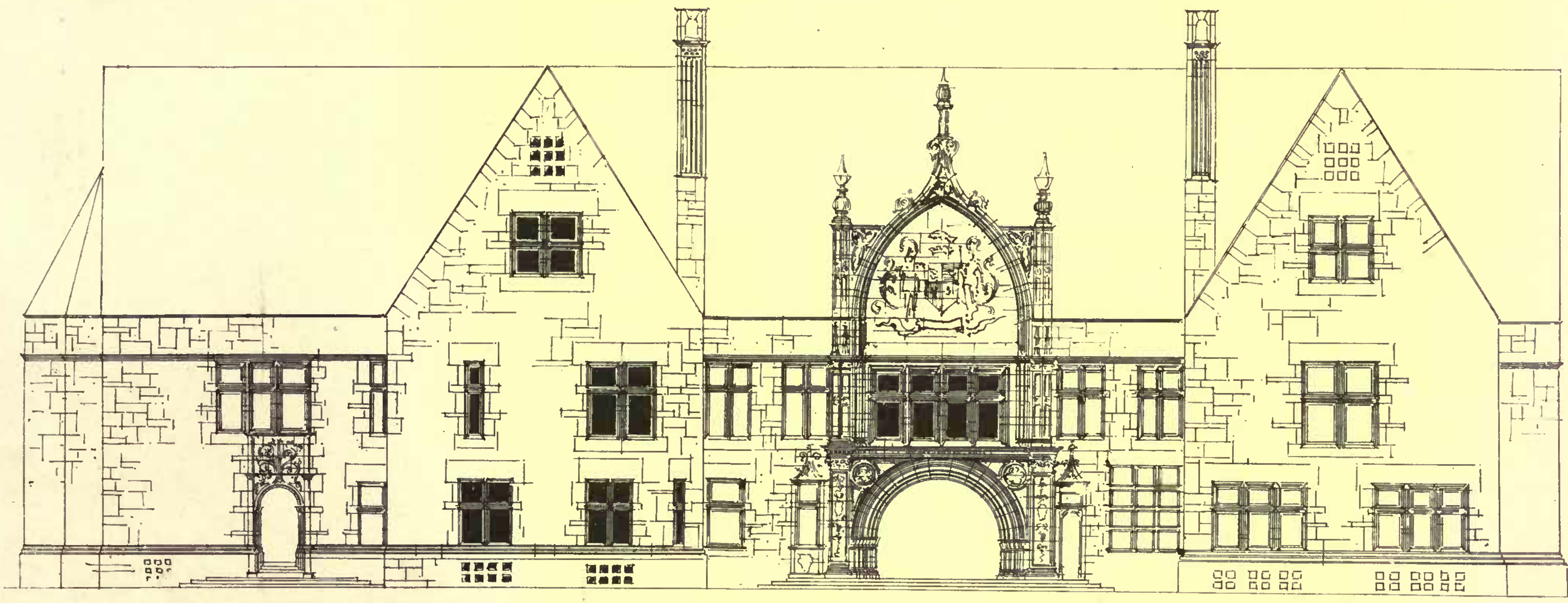


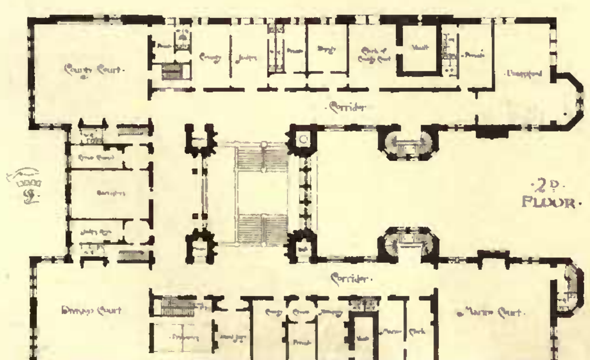


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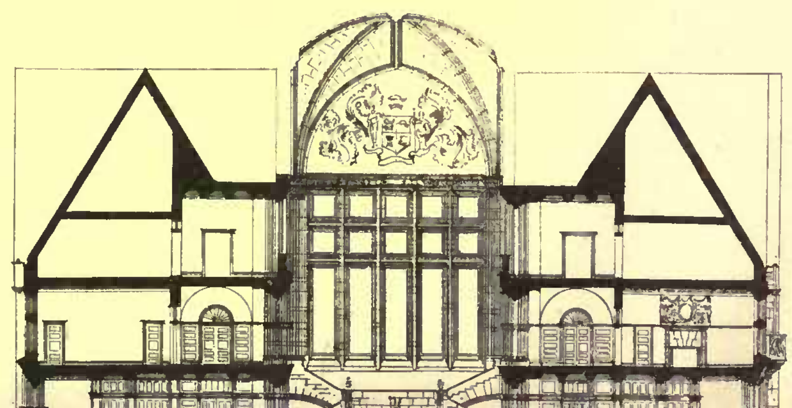
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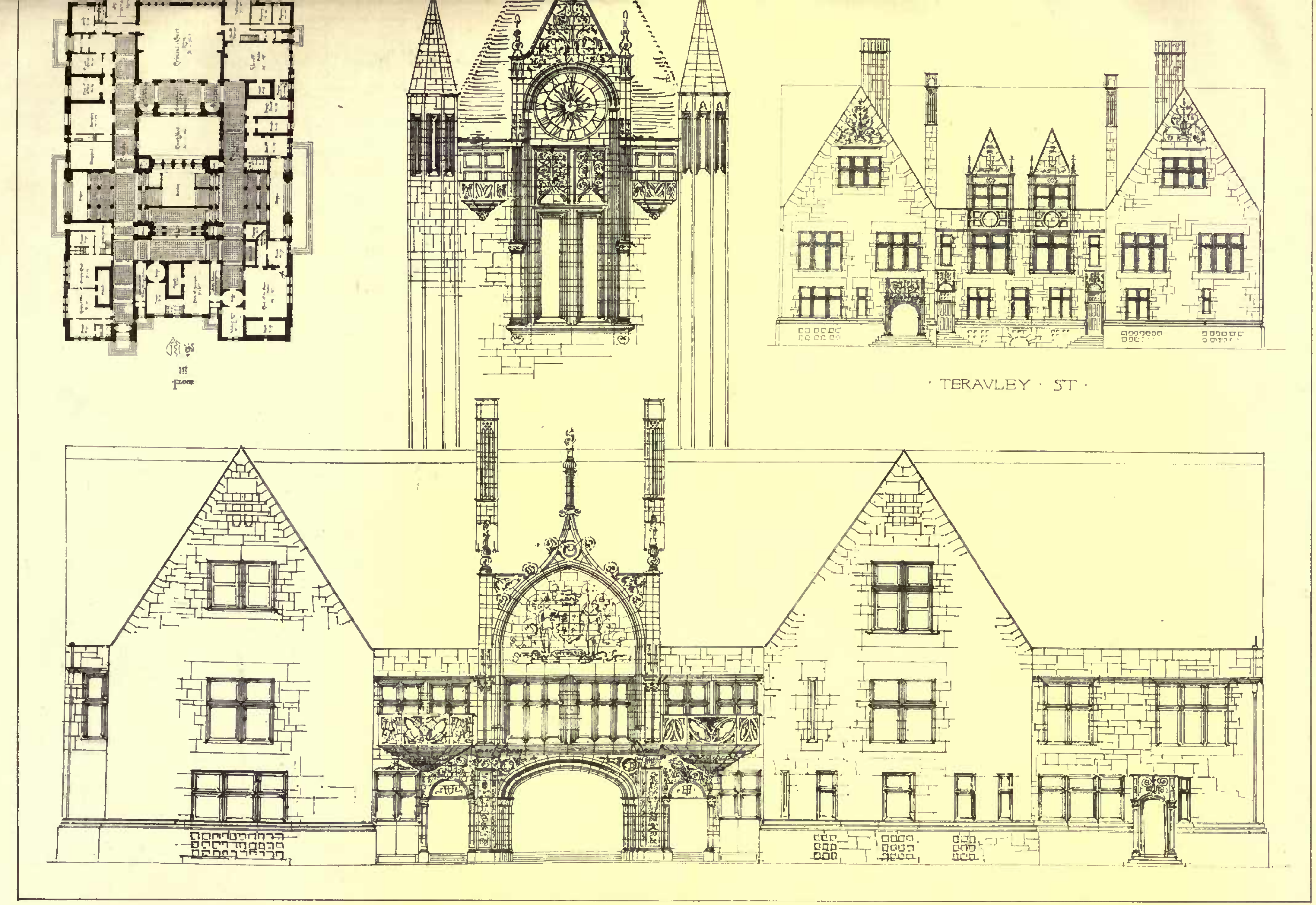




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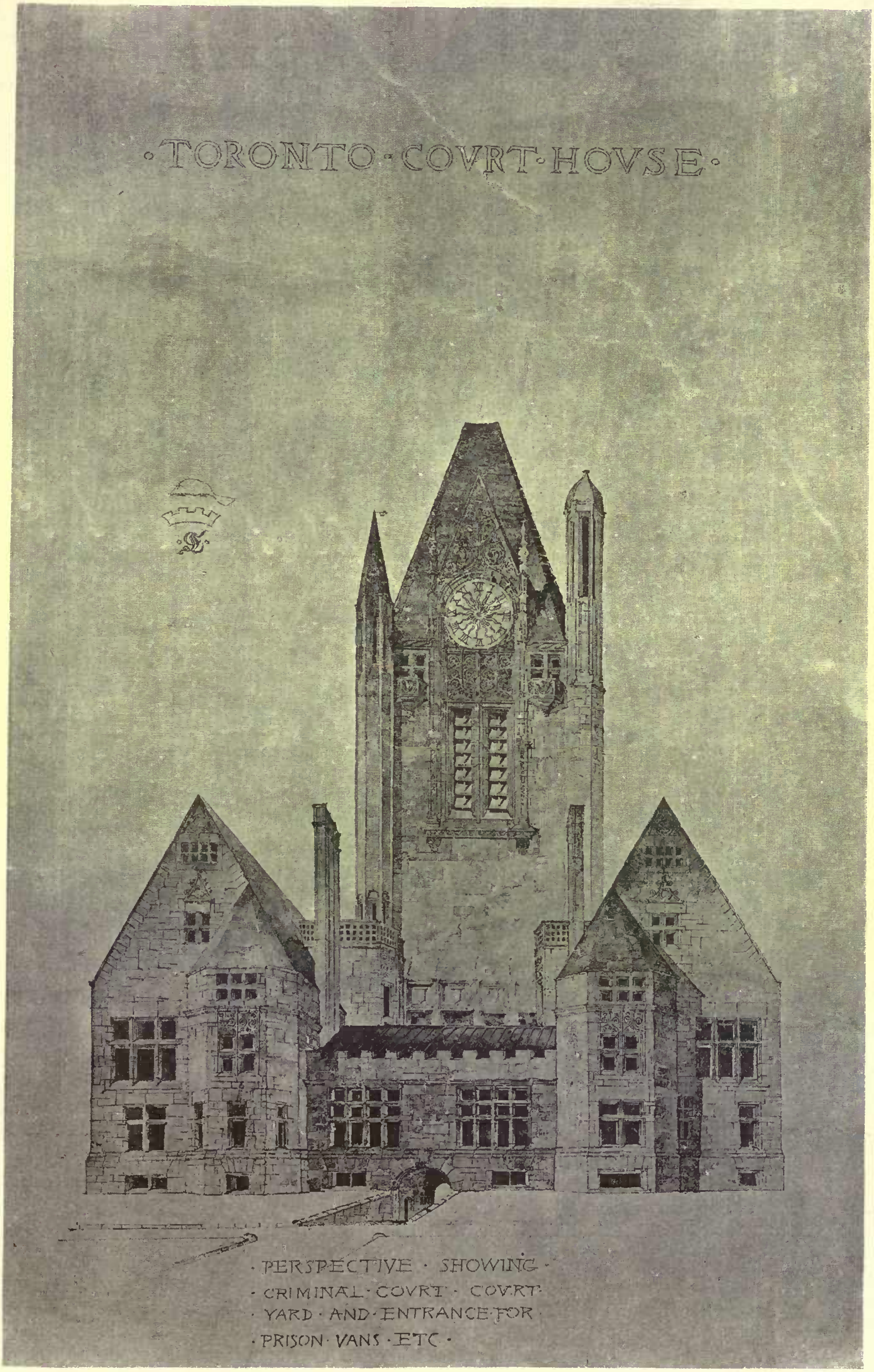
CLARENCE S · LUCE,
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NEW YORK.





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de Allende. As it is the work of an illiterate Indian, who, I was told, made his working-designs for the stone-masons with a pointed stick in wet sand, it is naturally crude in many of its details, but it certainly has a majestic ensemble with its broad and well-proportioned central tower — though too heavy for the Gothic spirit — as the main feature of the beautiful little hill-side plaza, and with surroundings reminding one of a typical mediæval European town. The base of the tower forms a portico with entrances on its three sides. The façade was unfinished at the time of my visit, and it was interesting to note the gradual masking of the plain old Renaissance twin towers with the subordinate flanking towers of the new structure. It was the only example of "transition" architecture which I have ever seen on this continent, and it seemed like a living illustration of the way in which some of the old Romanesque churches of Europe obtained the Gothic features which crop out here and there. It was probably the intention to transform only the façade, leaving the dome and other old parts intact.

The views of the charming city on its gentle slope, its foot carpeted in green meadows and its head adorned with a garland of luxuriant gardens, with the unwonted spectacle of a Gothic spire as a focal point, is something to be remembered. The difference of altitude between the east and west ends of the city, which are respectively high-up on the hill and down on the valley level, is so great that the place really possesses two climates, and while certain fruits are in bloom in the gardens of the upland, they are ripening in the lowland. San Miguel, though now reached by railway, is seldom visited by tourists, being at present off the through-lines of travel, but there are few cities more worthy a visit by lovers of the picturesque.

About an hour from Silao, going north on the Mexican Central Railway, is the large city of Leon, with a population estimated as high as one hundred thousand. It is in the midst of a particularly fertile region, and, as we approach through a wide stretch of level fields, we see the high twin towers of the cathedral long before we come in sight of the low, wide-spreading buildings of the city with a near background of rugged mountains. I spent three days there once, doing little but enjoy the soft, delicious climate, just the thing for *dolce far niente.* The *posada*, or inn, was on two sides of the street just in the rear of the Plaza Mayor; the main structure, of one story with rooms opening off a *pátio* brilliant with gorgeous tropical blooms of flowers and vines, while across the way it rose to the dignity of two stories, where I had a room overlooking the plaza with its thicket of trees and blooming shrubs, enclosed in a heavy stone balustrade. Paths, running beneath arbors thickly matted with vines that afforded dense shadow at noonday, converged at a clear fountain running in a basin of stone that, with the surrounding seats of the same material, was beautifully carved with the light green, malachitish-looking stone, being so close-grained and hard that it was capable of extremely delicate manipulation.

Across the plaza, diagonally, stood the great market-house, with a noble arched entrance, and walls presenting a fascinating study for a colorist, with roseate and *verde antique* hues predominating in the weather-stained tones of the wash, or paint, covering the masonry. The interior was airy, lofty, and well-arranged, and the large fountain in the centre, rich colors of the piles of fruit and vegetables, and the costumes of the venders and buyers gave an Oriental aspect to the place. Excellent features of many Mexican towns which I have visited are the large and handsome market-houses: the new market-building opened in Toluca in 1883 would be a credit to a European or American metropolis. Indeed, there are probably not a half-dozen market-houses in the great cities of the United States which could vie with it in architectural merit, or hardly in extent.

Leon is a manufacturing city, and has been called by an English writer the "Manchester of Mexico." If that writer had ever seen the city he would hardly have made such a comparison, for there is nothing at all about Leon resembling one of our manufacturing towns like Lowell or Fall River, for instance. Nearly all the manufacturing is done by hand, and in the houses of the workmen, where the slow clatter of the rude, wooden looms may be heard through open doors and windows as one passes through the streets. The production of the city is large, and a considerable part of Mexico is supplied from Leon. The fabrics, consisting of *zarapes* and *rebozos*, or woolen blanket mantles and cotton scarfs, are of coarse grades, the former gaudy in hue and the latter somber, and not to be compared with the beautiful goods made at San Miguel and Santillo. Towards evening, and all day Sunday, the weavers throng the neighborhood of the plaza, seated on the curbstone with the products of their looms piled beside them, waiting for purchasers, or strolling around in search of them with their goods in a pack on one shoulder. There was little bustle of bargaining, and the venders sat or stood so patiently that it seemed almost pathetic, and I felt like taking pity on them and buying a few *zarapes* and *rebozos* just to encourage trade. But they had nothing which I wanted, and I concluded that there must be plenty of business conducted in some undemonstrative fashion, or manufacturing would cease. This hand-loom industry is so extensive in Leon that a considerable cotton-mill in the city is devoted exclusively to turning out yarn for the local demands.

I was, however, strongly tempted to buy one of the handsome leather suits which are a specialty in Leon; made of soft, dressed deer-skin, close fitting, and either stained in agreeable gray, russet or black tones, or remaining the natural yellow, and adorned with tasteful embroidered designs. I was told that one of these suits could be had, made to order and fitting perfectly, for twelve dollars! Leon does an extensive leather manufacturing business; good-looking boots and shoes are turned out on the same small manufacturing system, very much as they were in Lynn and other New England shoe towns before the introduction of machinery. A German firm has recently established a shoe factory in Leon, using American machinery, and is doing a good business. I visited the establishment and found the operatives well-dressed and intelligent-looking young men, and was told that the work was, in itself, an education for the employés, quickening the senses and converting a plodding laborer into a bright artisan. The court-yard of this factory was resplendent with flowers and blooming vines, and there was a tree of the euphorbia family full of blossoms, trumpet-shaped and of a delicate roseate hue, filling the air with an exquisite fragrance. I pressed one of these flowers in a book I had with me, and a faint scent thereof lingers still among its leaves, after nearly two years.

On a street corner not far from the plaza stands the theatre, built within a few years; a handsome building with an airy auditorium and stately entrance and foyer.

There are few buildings in Leon of more than one story, and the city consequently spreads out over a wide territory. A feature of the architecture was the prevalence of carved stonework about the windows and doorways, even in the commonest houses.

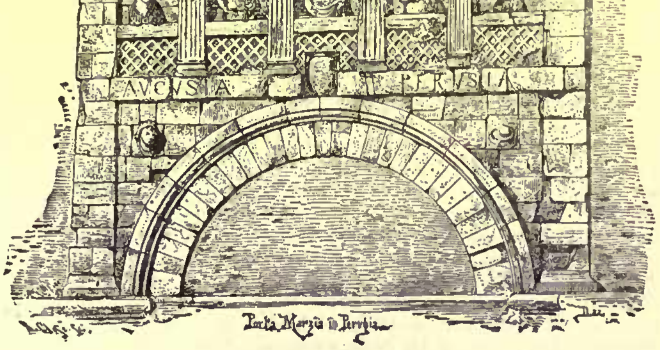
The population of Leon is overwhelmingly Indian; frugal and industrious, as shown by the work now accomplished by the crude old methods. The low cost of living, and the abundance of labor ought to make the place into an important manufacturing centre of the modern kind, now that good railway facilities are established, provided that cheap motive power can be obtained.

The next important place to the northward is Lagos, about one hour and a half by rail from Leon. It is in the State of Jalisco and the point of departure by stage for Guadalajara, the capital. It is a manufacturing place, with some considerable cotton-mills. Lagos is a butt for Mexican jokes. For instance, they tell about a Lagos man who had a hole in the ground on his land which he wished to get rid of, so he dug a second hole beyond it, filling up hole number one with the dirt excavated therefrom. But then he still had a hole on his hands, and so he dug another hole yet farther on and filled up number two, repeating the operation a dozen times, or more, until finally, after a hard struggle, he succeeded in moving the hole off his land and dumping it into the river!

The most notable feature of Lagos is the great parochial church, mistakenly called the cathedral by many visitors. It has some interesting individual features, though following the usual form with two towers and a dome. The towers are tall and graceful, their aerial effect heightened by the graceful pavilions in which they terminate, surmounted by light iron crosses; breadth as well as adornment exceptional, considering the absolute plainness generally prevailing, is given their bases by octagonal buttresses at the corners. The façade, with florid rococo work, rich, but not overladen, is recessed between the towers, and the whole structure gains dignity from the broad, strong steps extending its entire width and leading up from the plaza adorned with orange trees below. The effect would be still better were the high iron fence at the foot of the steps taken away.

SYLVESTER BAXTER.

THE STYLE OF LOUIS XIV.[1]



THE long reign of Louis XIV, brilliant as it was with all the glories which Frenchmen hold most dear, has always been, in our eyes, the most humiliating example in modern history of the supreme triumph of humbug. The politics, the wars, the finance, the internal administration of that tremendous and most expensive swell all partook of the character of the sovereign — selfish, insolent, pretentious, and without foundation in good sense, patriotism or honesty of purpose. That the fine arts of the period, whose liberal encouragement for half a century was inspired not by the love or appreciation of art for its own sake, but purely by the all-pervading passion for personal aggrandizement and personal display, should be distinguished by a flamboyant and meretricious quality bordering pretty

[1] *Le Style Louis XIV.* Charles Le Brun, Décorateur; ses œuvres, son influence, ses collaborateurs, et son temps. Par A. Genevay. Paris: Librarie d l'Art, 1886.

closely on vulgarity, is what might have been expected in the nature of things. The impulse of the Renaissance, a century earlier, proceeding from Italy and carefully fostered by the Valois kings, in whose detestable careers their enlightened patronage of art stands out as the one respectable feature — this impulse had died out under Louis XIII; the influx of Italian artists had ceased, and their example had been insufficient to found in France a school of answering excellence to the Italian school. The next impulse, fruitful enough in its own way, came from the ministers of "the sun-king," notably from Colbert, whose broad views of national grandeur included the artistic development of every branch of the industrial arts, and as in the time of Francis I, Primaticcio was put in charge, first of the extensive decorations of Fontainebleau, and later of the whole field of the fine arts, as part of the royal administration, so Colbert, upon his accession to the ministry in 1662, looking about him for an artist of sufficient ability and training to fit him for this broad control of the arts, and with the spirit of the courtier to use them for the exclusive embellishment of the royal person and his *milieu*, fixed at once on Charles Le Brun.

Le Brun was then forty-three years old. His remarkable career of nearly fifty years had commenced in 1642, when, at the age of twenty-three, he was fortunate enough to attract the notice and friendship of the Chancellor Seguier, who sent him to study at Rome. On his way to Italy he fell in with Nicholas Poussin, who was returning thither from Paris, and who, knowing the young painter by one at least of his works (a picture of Hercules seizing the horses of Diomedes, painted by Le Brun when he was fourteen years old), was glad of the opportunity of fostering a genius of which he had already predicted great things. They travelled together to Rome, and, under the protection of Poussin, Le Brun found the way to success open broad before him. He was not slow in following it. He remained in Rome four years, returning to Paris in 1646. His first visit, says M. Genevay, was to his patron, the Chancellor, to whom he presented a portfolio containing sixty-five drawings from the pictures in the Vatican and other Roman galleries, accompanied by a dedicatory letter.

His reception in Paris was cordial and flattering. Orders for pictures flowed in upon him, and were shortly followed by more important commissions for decorative painting. He painted the ceiling and an altar-piece for the chapel of the Seminary of St. Sulpice. In conjunction with Le Seuer he painted the ceilings and walls of the Hôtel Lambert on the Quai d'Anjou, and a little later he was commissioned by Fouquet, then at the height of his power, to decorate in the most sumptuous manner, first the Château of St. Mandé, and then the yet more extravagant and princely residence — "*cette prodigieuse folie qui s'appelait Vaux le Vicomte.*" At Vaux, Fouquet wishing to assure himself of the exclusive services of Le Brun, appointed him director of the painting, giving him, in addition to the payments for his own works, a pension of twelve thousand livres, in consideration of which he not only filled the palace and gardens with works of art of various kinds, but was charged with the invention and superintendence of the numerous festivals, "*fêtes pompeuses et gulantes,*" with which the magnificent minister was in the habit of entertaining the court of Louis, the splendor of which the monarch himself must have found it sometimes difficult to surpass.

If the king could not outshine the minister, he could at least disgrace him, and this he did promptly and without a qualm, sending him to drag out a long remainder of existence in prison, and to reflect with what philosophy he could command on the vanity of earthly grandeur. In 1661, the small gallery of the Louvre, now known as the gallery of Apollo, was seriously injured by fire. The queen-mother ordered M. Ratabon, superintendent of the royal buildings, to proceed at once with the rebuilding of it. M. Ratabon had a feud with Le Brun, which, however, the position of the latter did not permit him to indulge by ignoring him altogether in arranging for the new decorations. He went as far as he dared in dividing the work between Le Brun and Errard. To Errard, who enjoyed the favor of the queen, was entrusted the sculpture and the general ornamentation; to Le Brun the paintings. The two artists were invited to send in their designs to the council. Le Brun had no idea of submitting to this division of the work, and on the appointed day appeared before the council with a fully elaborated scheme embracing the whole treatment of the gallery, paintings, sculptures, decorations and all, which he expounded to the official persons with such persuasive eloquence "that these gentlemen were all charmed, and declared unanimously that nothing could be finer," to quote the words of a contemporary reporter. Errard, arriving a little later with his sketches under his arm, finds the council in a high state of enthusiasm over the plans of Le Brun, expresses himself freely respecting the assurance of his rival in appropriating those portions of the work which had been assigned to him, refuses to exhibit his sketches, and marches off. Le Brun's triumph is, however, short-lived, for Ratabon holds still some good cards, and by a little management procures a decision from the queen that the division originally ordered shall be adhered to. All this has a familiar sound—as M. Genevay observes, "*on dirait une scène de notre époque.*"

Le Brun was beaten for once; but he was able to turn defeat itself into final victory. The quarrel was taken up by the Académie with great energy. Le Brun, who was the Chancellor, at once sent in his resignation, and behaved with such persistent ferocity towards poor Ratabon that it was felt necessary to make use of some diplomacy to appease him, and when, a little later, it was determined to redecorate the gallery of Apollo with extraordinary splendor, there was no longer any hesitation on the part of any one in giving to Le Brun the absolute control of the work in all its parts. Sculpture, painting, gilding, inlay, tapestries, furniture, were all executed, if not from the designs, at least under the eye of the master.

All this work at the Louvre was, however, arrested in mid-career by the caprice of the monarch, who had conceived the desire to create at Versailles his own especial palace, the centre of his visible royalty, whose splendor should hold no association but with his own personal glory. Le Brun was therefore transferred to Versailles, and in July, 1662, was appointed first painter to the king, with a pension of twelve thousand livres, with a patent of nobility and a brand-new coat-of-arms thrown in.

At Versailles Le Brun found his great field, and here he is to be seen in his most characteristic and splendid manner. The paintings which ornament the grand galleries and halls and staircases of the palace record in the most flattering colors the personal history of the sun-king from the moment when "in the midst of peace and in the bosom of pleasure he declares his resolution to govern by himself." But the paintings by no means represent the extent of Le Brun's labors at Versailles. The sculptures, the tapestries, the arabesques, the trophies in bronze, of the interior, the fountains, the terraces, the vases, statues and grottos of the gardens — he had a hand in them all, and the whole corps of artists engaged on this majestic residence was subject to his guiding will.

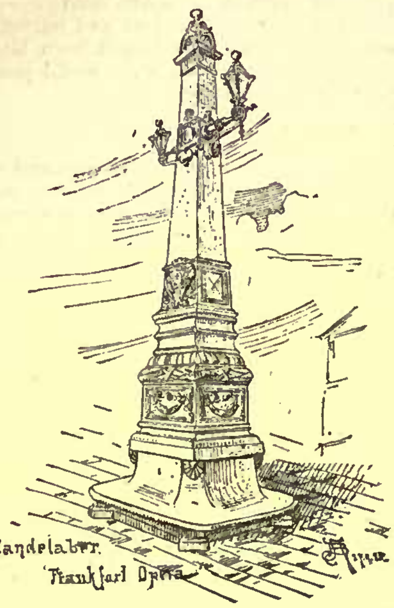
It was at this period that Colbert, who had succeeded Fouquet as Minister of Finance, saw the advantage of putting into the hands of this triumphant artist the direction of all the various departments of industrial art which had any connection with the embellishment of the royal palaces or the public buildings. The Gobelins, of which Le Brun was made director in 1667, at once became the centre of an extraordinary artistic activity. The manufacture of the great tapestries was of course the chief interest of the place, employing two hundred and fifty workmen, and turning out in twenty-five years between seventy and eighty *textures*, covering upwards of eight thousand square *aunes*,[1] at a cost of one million seven hundred thousand livres. But besides the *tapissiers* the force of artists working under Le Brun comprised silversmiths, workers in ebony and mosaic, embroiderers, engravers, draughtsmen — all, in fact, who had to do with the ornamentation of the palaces or the furniture of the king. The Gobelins became thus a school of art, with Le Brun for its master. Here was the nursery of the *style of Louis XIV* — style well named, since its one guiding principle and inspiration was the glorification of this man. Of this style Le Brun may justly be called the author; pupils and artists drew from his models; he gave the designs for statues, bronzes, furniture; he became, to use the words of M. Genevay, "the regulator of all forms." For a generation nothing was done at Versailles, at the Louvre, at Saint Germaine, without his sanction. At the constantly recurring festivals at Versailles the hand of Le Brun controlled the decoration of the gardens and the apartments, and even designed the costumes of the participants. On occasions of unusual ceremonial splendor, as of a royal entrance, a baptism of a dauphin, a celebration of a victory, Le Brun was the decorator of such streets, squares or public monuments as were the scene of the ceremonies. Perhaps the most notable of these occasions was the funeral of his early patron the Chancellor Seguier, whom he never forgot to honor as the maker of his fortune, and who lived to see his protegé at the height of his renown. The obsequies of the Chancellor were celebrated with extravagant pomp in the Church of the Oratoire, which was draped throughout and hung with pictures, emblems and devices having reference to the life and character of the Chancellor. The central portion of the church was occupied by a prodigious catafalque, which touched the vault of the ceiling. An engraving has preserved for us the general character of the amazing structure, and a lively description by Madame de Sevigné has supplemented the engraving. Four gigantic skeletons bearing the broken mace and the ducal crown of the Chancellor surrounded the base of the catafalque; four arts mourned the loss of their protector; four virtues bore witness to his fame; four angels somewhere above received his liberated soul; several other angels sustained, at the summit of the monument, a *chapelle ardente*, blazing with a thousand candles. "Nothing was ever seen," says Madame de Sevigné, "so magnificent nor so finely conceived. It was Le Brun's *chef d'œuvre.*"

But our notice grows too long. The story of Le Brun's career, told by M. Genevay in these sumptuous pages, with small literary skill, is full of varied interest. It puts before us, in vivid colors, the aspect, from the point of view of the fine arts, of that amazing page of human history which will always be known as the age of Louis XIV. As the age was the age of Louis, as the finances were the finances of Louis, so the arts were the arts of Louis, and their mission was to record and hand down his glory. Such are not the conditions under which the arts have risen in more fortunate ages to their high-water mark. Rather, as M. Videt has well said, they are conditions "favorable to the development of a submissive mediocrity, but fatal to that of superior and original talent."

When Le Brun had to make, for one of the king's palaces, a copy in tapestry of Raphael's "Judgment of Paris," he draped the goddesses à la Montespan, and ornamented the head of Paris with a flowing wig in the "style of Louis XIV." C. A. C.

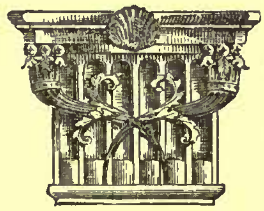
[1] The French and Flemish cloth measure corresponding to the English ell. The *aune usuelle* is one and one-fifth metres; the old *aune* a little shorter.

THE RIGHT TO AN EXTRAORDINARY AMOUNT OF LIGHT.



IT is to be regretted that the law upon the above subject is not in a settled state, because it is a matter of much importance to many who have valuable businesses in our great towns to know what their rights are if the light to their premises is diminished. In ordinary cases it is well known there must be a substantial diminution of light in order to give the owner of the dominant tenement a right to legal relief. But where light is used to an extraordinary extent for the purpose of a particular business, it is obvious that a less amount of obstruction may put an end to the business altogether. Is, then, the owner of the servient tenement in such a case as this, to be in a worse plight than if he had obstructed the light to a dwelling-house or to a building which only required a normal amount of light? It is unfortunate that as full and satisfactory a reply to the question cannot be given as is desirable. The law may, however, to a certain extent, be definitely laid down, and it is as follows, putting it into the form of a legal proposition: The owner of a dominant tenement has a right to an extraordinary degree of light necessary for a particular purpose, when such an amount has been openly and uninterruptedly enjoyed for twenty years. So far as the first part of that proposition goes, the law is plain, and is supported by several judicial decisions, but these, to a certain extent, qualify it. In Lanfranchi *vs.* Mackenzie, decided some years ago by the late Vice-Chancellor Malins, the judge laid it down that such a right as above expressed was good against all persons who had reasonable knowledge of such uses. This, it is obvious, very considerably diminishes the extent of the above proposition, and only allows the right to prevail against a limited class of persons. But the general principle on which a right to light is gained in ordinary cases is by a twenty-years' enjoyment, irrespective of any knowledge on the part of the owner of the servient tenement or any one else. The mere open and uninterrupted enjoyment creates the right, and therefore it is a little difficult to see why there should be a distinction between the use of light for ordinary and for extraordinary purposes as regards creating a statutory right to it. Hence we are inclined to think that the right is valid, whether persons know of it or not, so long as the enjoyment is open and uninterrupted. But the late Vice-Chancellor Stuart gave relief in the case of an obstruction of light used for an extraordinary purpose after eight years' enjoyment, and the same has been done in Ireland in the case of a seed-merchant, who had used a room for sampling seeds for seventeen years. But it is here again difficult to see why a person who has a special use for a room with a strong light, should be in a better position than a person who only uses one for ordinary purposes. In both these cases to which we have referred, there was, no doubt, a right to a substantial amount of light, but that, again, seems to be no sound reason why a right to a still greater amount of light should be engrafted on the other right in a shorter period than is required for obtaining a statutory right under ordinary circumstances. If this legal doctrine is sound, the result is that if A builds opposite a counting-house or a bank in the city, and slightly darkens the rooms, he has done no legal and actionable wrong. But if he happens to have opposite to him a diamond merchant or a silk merchant, who requires a strong light for sampling there, his building may be stopped, because, though he has thereby only slightly diminished the light of the dominant tenement, yet he has obstructed it sufficiently to interrupt the particular business which requires an unusual amount of light. Therefore the view of Vice-Chancellor Malins, that twenty years' use of an extraordinary amount of light is required, seems the soundest in law and most consonant with general convenience. We have a strong doubt, indeed, whether it is altogether advisable that there should be any right to an extraordinary amount of light obtainable. It causes one class of owners or occupiers of dominant tenements to be favored above others, to the disadvantage of the general body of building-owners. Moreover, the balance of convenience seems to be in favor of allowing a person to build if he only slightly disturbs a man's light, and for the person who requires an extraordinary amount of light to move elsewhere. The conflicting interests of the owners of the dominant and servient tenements are always difficult and often impossible to reconcile. In the case of granting interlocutory injunctions to prevent the continuance of buildings which obstruct the light of another building, the Court always regards "the balance of convenience," and if we apply the same test to this point now under discussion, it will compel most persons to say that there should be no right to an extraordinary amount of light. Meanwhile, however, the law says that such a right can be gained, but judicial decisions differ as to the manner in which it can be acquired, and until some authoritative decision of the Court of Appeals, the question will remain a doubtful one. — *The Builder.*

THE TABERNACLE AND THE TEMPLE.[1]



THE most sumptuous and elaborate work that has appeared of late years on the structure of the Tabernacle and the Temple, has been prepared by Timothy Otis Paine, LL. D., who tells us that he has spent thirty-three years' work upon it; and a careful inspection of his pages confirms the statement fully. He takes into consideration Noah's Ark, the Tabernacle built in the the Wilderness of Sinai, the Temple at Shiloh, Solomon's Temple on Mount Moriah, the House of the Forest of Lebanon, (which he happily calls the "Capitol,") the Temple of Ezra, the rebuilding under the Maccabees, and Herod's Temple also is not ignored. He examines carefully *all* the Scriptural statements touching these buildings, as well as the variations given in the Septuagint, the Coptic version, the old Itala, besides comparing carefully the Chaldee Targums, the Syriac and Samaritan Scriptures, the Greek of Josephus, the Hebrew of the Talmud, and of leading Jewish Rabbis. The references are so numerous that more than a page, containing three columns of fine print, is needed merely to give an index of the *abbreviations*, used to facilitate reference! His examination of the accounts in Kings and in Ezekiel is very beautiful, demonstrating the perfection with which they dovetail into each other, each supplying the details omitted in the other. Dr. Paine contends that the misunderstanding of three Hebrew words in the description has hitherto confused all previous attempts to restore the plan of Temple and Tabernacle. As to the Temple, one of these words he renders "spreadings," showing that, on the inside, the Temple was narrowest on the ground floor, and that the three galleries were three "spreadings," of increased width. The first offset added five cubits to width on each side; the second added six cubits on each side; and the third added seven; and these ran round three sides of the building — north, south and west. The same style of structure, with variations, he claims for the House of the Forest of Lebanon. These offsets, in both buildings, were supported by exterior colonnades, each offset having a colonnade of its own, the outermost being, of course, the highest, the next being somewhat lower, the third still lower, and responds of "pilasters" against the main wall completing the arrangement. As to the Tabernacle, he tells us that "the form of the Tabernacle has been lost to the world for about three thousand years," for want of understanding that the word, translated "taches," really means "curtain-knobs."

As to the architectural result, it is clear that the two chief buildings, as reconstructed by Dr. Paine, are a striking peculiarity in the history of great structures. The threefold colonnade would be a most imposing thing, far more so than the colonnade surrounding any Grecian temple. But there are some features of the plans to which we find it impossible to reconcile our minds, as matters of architectural taste and beauty. That *two* such great quadrangular buildings should be erected with perfectly flat roofs is unsatisfactory enough. That the sort of broad entablature, ten cubits high, which surmounts the outer colonnade, should be almost unbroken, except by a narrow cornice at the top, is still worse, for the narrow lights and the bean-pole palms do not amount to much. But worst of all is the east front of the Temple, around which the three colonnades are not continued. The immense flat wall which cuts straight across that whole east end is broken in outline only by the three step-like projections of the three galleries on each side, resting on their graded pillars, and one narrow little window at the end of each gallery. Besides this there is only the narrow cornice at the top, and the low, square-headed door in the middle on the ground floor, with the porch flanked by two small staircases of entrance to the first gallery. This porch and east wall are unspeakably ugly. The two famous pillars, Jachin and Boaz, he makes to be the pillars of the porch. They stand about thirty-five feet from each other. They bear a horizontal entablature connected with the lines of the rest of the building only by the narrow cornice, while the rest of it abuts upon the dead wall of the east end without pilaster or anything else! We could accept every other part of Dr. Paine's work with little trouble — but that east end never! There *must* be some mistake about *that!*

This most elaborate and conscientious treatise, however, marks an era in the investigation of the wonderful, mysterious and most important structures to which it is devoted; and no future writer on

[1] "*Solomon's Temple*" and Capitol, Ark of the Flood and Tabernacle; or The Holy Houses of the Hebrew, Chaldee, Syriac, Samaritan, Septuagint, Coptic and Itala Scriptures; Josephus, Talmud, and Rabbis. By Timothy Otis Paine, LL. D. Illustrated with forty-two full-page folio plates, and one hundred and twenty text-cuts, drawn by the author. Boston: Houghton, Mifflin & Co. 1886.

the same subject can fail to return his most grateful thanks to Dr. Paine.

The number of wood-cuts and photo-types rises to between one and two hundred. The photo-types are all from the designs made by the hands of the author himself, and the minuteness of measurements and details is simply wonderful. The work is not a bound volume. The letter-press consists of folio-sheets, each folded only once, and giving four pages of large, bold, double-column print. The plates are on separate sheets. The whole is put up in four "sections," each section having a stout paper envelope of its own. The sumptuousness of paper and type is of the best style of the famous Riverside Press.

BOOKS AND PAPERS.

THE STATE CAPITOL AT HARTFORD.

So far as we know, the only way in which the readers of this journal suffered through the business disaster which overtook its publishers last spring was the unforeseen intermission in the publication of the "*Monographs of American Architecture*," which had begun a short time before and promised to meet with signal success. Even this slight grief is now assuaged by the appearance of the second "*Monograph*," which is as perfect a piece of book-making as was the other, while it should meet with more acceptation, since its subject is not, as in the former case it was, a somewhat small and to a degree private, though architecturally most excellent building, but is a large public building which the suffrage of the profession itself has ranked amongst the best ten buildings in America, and which the local pride of the good people of Hartford probably places at the very top of the list.

A better idea of the building could not be conveyed, than can be obtained from this score of gelatine plates, which exhibit its features, both inside and out, in a most satisfying way; and considering that the structure is of white marble, which our pure atmosphere has left comparatively fresh and undiscolored, we cannot but feel that the photographer has succeeded wonderfully in producing plates so satisfactory from the purely artistic point of view.

Built on the ground once occupied by Trinity College, the capitol enjoys a site which could hardly be bettered; standing free from all obstructions, it benefits by the sylvan character of the little park which adjoins it, and which in itself is a pretty bit of landscape gardening. The chief feature of the building and the best one, is the central tower, with its domical roof, though the manner in which it is designed makes it look unpleasantly like an after-thought, as it has the air of being planted on the roof of a completed structure, rather than a thing supported on foundations provided at the very beginning of all operations; and yet those who know the tale of the construction of this tower and the lessons it teaches, know that the architect had sufficient time to study and provide a means of uniting this grand central feature to the main mass of the building. We do not recollect at just what stage in the construction it was discovered that, owing to the unequal settlement of the cores, an unforeseen strain was brought on the ashlar-facing of Westerly granite of the great tower-piers, with the result that those facing-stones were cracking and spalling in every direction. But for two things — one the anxiety of the superintendent of construction to make handsome work, which led him to set the ashlar with fine flush-joints of lime-mortar only about one-sixteenth of an inch thick, and the other the scandalous conduct of some one who allowed these stones to be cut, not with perfectly flush and level beds, as the specifications required, but with simply a chisel-draft round the outer edges of the beds, while all the surface behind was hacked away, so that the stones had fair bearing only on their outer faces — but for these two things the unequal settling of the cores might not have been disastrous; but, as things were, disfigurement was certain, and downfall perhaps inevitable. Though many were consulted, it was not easy to find the right cure, and we never knew whose ingenious mind it was that suggested the remedy finally and successfully used. Holes were drilled in each horizontal joint, and as much of the mortar as possible was raked out and into these cavities melted type-metal was run — under pressure, we believe. The settling was checked after some tons of metal had been run in, and there has been no movement since. The next step was to cut out the drill-holes and insert bits of granite about three inches square. This was done so deftly, and the pieces were selected so judiciously as to their coloring that most men would never note that the stones were not perfect. The larger blocks that fill the place of the pieces which had spalled out are more noticeable, as are the cracks which were filled with a cement of granite dust.

There are many points about the building open to criticism, and one is the stairway, or want of stairway. It seems incredible that a monumental building should have to put up with such contorted and inadequate stairways, when one really monumental staircase could have been introduced so easily. But there are counterbalancing good points, one of them being the hall of the House of Representatives — admirably shown in Plate XVII — which not only in its architectural arrangement is most satisfactory, but in its color-decoration is entirely the most harmonious and effective piece of interior coloring we have ever seen — bar the ghastly marble panels in the clerestory! Only the artistic immorality of the architect and decorator who could disfigure the vaults of the north corridor with the barbarous — not barbaric, that is sometimes good and harmonious — color and design, shown on Plate XV, could have been blind to the certainty that these great planes of staring white would jump at the eyes of the beholder, as the French say.

How the time flies! Here is the new year well under way, and we have not yet offered a word of welcome to the several friends, new and old, who see in the vast number of men interested in various ways in building operations a possible clientage which is pleasantly suggestive of lucrative income.

Of our old friends the *Sanitary Engineer*, which some years ago abandoned to their fate the plumbers, whose educator it at first undertook to be, has, seemingly under some misgiving as to whether sanitation pays, advanced architecture to the second place in its sub-title, while sanitation is the last bob on the kite-tail, and it would not at all surprise us, as it is certainly one of the most progressive of journals, to find it at some time becoming an architectural journal as other architectural journals are. It benefits greatly in appearance by certain changes in its make-up, and its architectural illustrations, and so on, are always good.

Another old friend, the *California Architect*, is also greatly improved by its new form and style; but we think its moan that the Pacific coast — its own preserve — has been deluged by "tons of specimen copies" of Eastern architectural publications, is unworthy of the courage that has brought the journal to its present position, and perceived the benefits that might accrue from the improvements just referred to.

The *Inland Architect*, whose typographical excellences we always regard with admiration, marks the new year by the issue of an "intermediate number," devoted to reports of architectural society meetings, unillustrated by plates, which is, in every way, worthy of the parent publication; so that this journal is now practically a semi-monthly, at an increased subscription-rate.

Perhaps the most singular advance into the domain of architectural publication has been made by the *Art Age*, a monthly journal which came into being two or three years ago, with the sole object of giving instruction in the arts of printing and book-making. Naturally the field was a restricted one for a journal of such high aspirations; and now, like so many others, it seems to have found that there was still an architectural want unfilled; for we find, amongst other "departments" added this year, one devoted to architecture, and it is very far from being a bad one, though it seems out of place in a journal devoted to the arts of Guttenberg and Faust.

Amongst the wholly new journals is the *Architects' and Builders' Supplement* of the *Scientific American*. This new departure we can understand, and can perceive that its success is assured, not only because of the mass and character of the information that comes under the eyes of its editors, but because its publishers already have their fingers on a large class of men who have not time to read much, but know enough to read the best; and surely, for the mechanics of this country there is no better paper than the *Scientific American* and its several *Supplements*. Of the new one it is enough to say that it is recognizable as a chip of the old block, and that its distinguishing feature is a colored plate, which in its execution is much superior to what is usually found in such publications.

Philadelphia has not, we believe, done much toward fostering the arts of building through the publication of building journals, but this year we find one coming to our table from that city. The *Philadelphia Real-Estate Record and Builders' Guide* seems to possess the elements of success, though our knowledge of the real-estate business does not qualify us to speak *ex cathedra.*

An Oriental Cantilever Bridge. — A letter from Yokohama, Japan, bearing date October 6th, gives the following description of an old bridge constructed by native engineers. The writer evidently shared the popular, but erroneous, impression that engineers had urged the claim of novelty in the cantilever principle. The following is the description *verbatim:* "At the sacred city in Nikko, the other day, I was rather amused and interested at seeing a fine and very costly bridge of cantilever construction — abutments of hewn stone, shore piers, hewn granite, octagonal, monolithic, mortised for stone girders; monolithic plate beam to receive wooden superstructure. The stringers are fastened into the abutments, balance over the stone beam, but do not reach, by considerable distance, the gap being fitted by middle stringers let into the shore stringers. The Niagara bridge is a mere amplification of this one, built before America was settled, as a religious duty, very expensive, of thick, red lacquered work, and, like a bridge of angels, its planks are never profaned by the feet of the laity But it seems queer-like, to come away here to find our new inventions. very old." — *Van Nostrand's Magazine.*

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

THE HOFFMAN CONTINUOUS BRICK KILN.

NEW ORLEANS, February 1, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— In your edition of January 23d, I find mention of a Hoffman Perpetual Brick Kiln as in operation in this city.

Some years ago one such was put up by a company in an old-established brick-yard. The company failed and their successor discarded the kiln, mainly, as I understand, on account of the necessity to keep it in blast constantly to its maximum supply, without regard to demand, together with other objections not now in my mind. Lately the kiln was entirely demolished and the bricks sold.

Yours, etc., JAMES FRERET, *Architect.*

AN ARCHITECT'S LIABILITY FOR OMITTED ITEMS.

LA CROSSE, WISCONSIN.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— I would ask, is an architect personally responsible for the payment of an item necessarily involved in the construction of a building, if said item is not mentioned in the specifications, and its omission not discovered until after the contract is made — the contractor proving that he was aware of said omission, and omitted the item from the amount of his tender, as did all who figured? The successful bidder was lower in his figures than his competitors by more than the amount of the item involved. The architect completed his services in good faith. The owner has paid but once for the item, which equals in amount the architect's commission.

SUBSCRIBER.

[No man can have things put into his house, and enjoy the use of them, at his architect's expense, simply on the ground that the latter omitted to mention them in his specifications. If the client were obliged to tear down or alter his building in order to insert something which ordinary skill and care on the part of the architect would have provided for, he would have a good claim against the architect for the extra cost of making the alteration in this way, but not for the reasonable value of the addition so made to the beauty or convenience of his house.—EDS. AMERICAN ARCHITECT.]

YELLOW PINE INSIDE FINISH.

ST. LOUIS, MO., February 5, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Will you advise me, through the columns of your valuable paper as to the advisability of using yellow pine for doors, etc. (inside). I am about to build, and some architects and builders advise me not to, and others have no objections; they are to be finished their natural state. Also, does this kind of inside finish cost much more than white pine (grained).

Respectfully yours, JOHN A. HOLSOM.

[IF you will use quartered yellow (hard) pine you will not be troubled by its splintering and checking, and will, moreover, obtain a very handsome wood finish. Sap-run stock should be avoided, of course. It would cost rather more than white pine of equal quality.—EDS. AMERICAN ARCHITECT.]

CITY-ARCHITECTS.

BOSTON, February 6, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Will you allow me to say a few words relating to your editorial in your issue of this date, on the "Proposed Abolishment of City Architect of Boston," and on official architects in general? Possibly the editorial would not have been written, could the action of the City Council, at its last meeting, in adopting the report of its committee, by vote of 57 to 3, that it is *not expedient* to abolish the City Architect's department, been foreseen.

Now, a few words in regard to city architects in general. You state that an official architect "rarely succeeds in bringing distinction to the city which he serves, through the conspicuous beauty or fitness of the buildings which he designs for it." Admitting that the exterior of most city buildings may not be such as to bring distinction to the city, I claim that that is not the purpose for which they are erected, and that they are at least as good as the work of the average architect.

The most essential part of any public building, and especially of school-houses, is their fitness for the uses to be made of them; and I am most positively of the opinion that an architect who, perhaps, does not design a school-house once in five years, cannot design as *fit* a building as one who is all the time at work on them, and who has the advantage of experience and a corps of assistants thoroughly trained in that class of work. In fact, an official architect who possesses the average amount of ability and ambition cannot well help becoming an expert on the class of buildings on which he is constantly kept at work.

In regard to school-houses, the writer is of the opinion that the later school-houses of Boston are better adapted to school purposes than those of any other city in this country, and that this is mainly owing to the fact that the city has had, for the past twelve years, an official architect to design its buildings. For example, the grammar school-houses of Boston recently erected, have a floor area of sixteen square feet and a cubic space of 216 feet to each scholar, with a supply of pure air of from fifteen to twenty-five cubic feet per minute, per scholar; figures which are obtained in but few school-houses in this country, and which are far in advance of the average school-houses in European countries, as given in Dr. De Chaumont's report to the International Congress of Education, held in Brussels in 1880. As to being bound down by the traditions of his office, it is seldom that a city architect can retain his office for a longer term than five years, and his successor, while he has his predecessor's plans to study, will naturally be ambitious to outdo him if possible.

No one who is familiar with the school-houses of Boston will deny that the city has reaped a great advantage in its last change of city architect, if only from the improved ventilation which he has provided in the buildings erected under his charge. Again, one of the strongest arguments in favor of an official architect is that, were there no such official, the school-houses would be given out to those architects who have the most political pull, and would be more under the control of members of the City Government, than is the case where an official architect is employed. EXPERIENCE.

[WHILE we are sorry that the Boston Common Council did not look on this matter as we did, we doubt very much whether we should have changed our opinion to suit theirs, even if we had known it beforehand. It hardly seems worth while to discuss, without more definite data, the question whether communities get better expert service by applying, when it needs such service, to the profession which can render it, or by hiring a man by the year at a low salary, to do such work as well as he can; but if, as "*Experience*" says, the last change in the office of city architect has brought a "great advantage" to Boston, in enabling it to secure in its school-house about one-half the supply of fresh air that an unofficial architect would think necessary, we cannot see precisely why the city got along so much better in this respect during the five years' service of the late incumbent, than it would have if it had obtained its expert advice from the usual sources; and the vote of fifty-seven to three in the City Council, against changing the present system of administering the public work, does not look as if the members of the Council believed that they could control the profession-at-large more easily than their regular employé.—EDS. AMERICAN ARCHITECT.]

A TALL MILL CHIMNEY AT LOWELL MASS.

LOWELL, MASS., February 6, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— In answer to R. M. Bancroft's inquiry in the *American Architect* of Jan. 16, as to the tallest chimney in the United States, we send the following particulars of the so-called "Jumbo" chimney of the Merrimack Manufacturing Company, Lowell, Mass., built in 1882 of which we were the builders. It is a round chimney, height from the surface of the ground 282.75 feet, diameters of base, twenty-eight feet, diameter of the narrowest part near the top, fifteen feet, diameter of flue, twelve feet; the amount of staging used was 28,000 feet, the number of brick used 1,050,000. The chimney is surmounted by a cast-iron cap of over nine tons' weight, its largest diameter being twenty-one feet. It is protected from lightning by a three-fourths inch cable conductor with two tips. The chimney was built to accommodate sixteen nests of upright Corliss boilers of three hundred horse-power per nest, and its sole use is to furnish the necessary draught and convey away the smoke from these boilers. The chimney was planned and engineered by J. T. Baker, C. E., at that time for the Merrimack Company. A full description of this chimney with plans and elevation was published in the *Transactions of the American Society of Civil Engineers* for April, 1885, Number 301.

Yours truly,

STAPLES BROTHERS, *Contractors and Builders.*

NOTES AND CLIPPINGS

DEATH OF ADOLPH DEMMLER, ARCHITECT. — One of the most prominent and well-known men of Mecklenburg, Hofbaurath (Supervising Architect) Georg Adolph Demmler, born at Guestrow, December 22, 1804, passed away the 2d of this month. Having studied architecture at the building Academy of Berlin, he entered the service of the State of Mecklenburg at the early age of twenty. By his extraordinary gifts and industry he soon advanced to the front of his profession. Nearly all the fine buildings with which the capital of Mecklenburg-Schwerin were adorned between 1824 and 1851, were planned and built under his supervision. Among them were the grand new palace and the beautiful theatre, which unfortunately burned down a few years ago. In 1851 he was discharged from his public position in disgrace, and without a pension, on account of his participation in the liberal movement from 1848 to 1850. He took to travelling, and did not return to Schwerin until 1857. He was one of the founders of the National Verein, the German People's Party, and the Peace-and-Liberty League. In later years he associated somewhat with the Social Democrats, and represented that party — although in a mild manner — in the Reichstag of 1877–78.— *Chicago Tribune.*

A Suit for Commission. — On January 23d, a judgment was recorded in the county clerk's office, in New York city *vs.* John D. Phyfe — one of the owners of the Plaza Hotel building — of $6,851.33, the result of a suit for professional services brought by Mr. Carl Reiffer, architect.

Archæological Finds at Avellino, Italy. — It is reported from Naples that a temple, houses and vast necropolis, with many thousand articles of domestic use, amphoræ, bronzes, coins, and at least one important inscription in the dialect of the Samnites, have been found near Avellino. The spot is the site of Cluvium, an ancient Samnite town near Meldo.

Berlin's proposed New Exhibition.— Berlin is going to strike out in a new direction in the field of public exhibitions. Various capitalists intend to do for the human family what zoological gardens do for the animal kingdom in general. The project is that of an antrepological garden, in which families of foreign people who are able to stand the climate shall continually reside, while every summer there will be importations of people from tropical and other countries. In connection with the garden an ethnographical museum will be established, and the institution will be made as comprehensive in character as possible. The idea is certainly a good one, and if it proves practicable — and there is no reason why it should not — we shall have a valuable addition to our public places of instruction and recreation.— *Pall Mall Gazette.*

The First American Telegraph, an Underground One. — The ground connection of the original Morse telegraph line between Washington and Baltimore, U. S. A., was an elaborate matter, consisting of plates of copper two feet wide and five feet long; the one at the Washington terminus being buried in a pit excavated under the pavement in the cellar of the Capitol, and that at the other end being sunk in the harbor at Baltimore. The present controversy over subterranean electric wires in American cities, has given renewed attention to the fact that the original invention of Morse did not contemplate anything but underground lines, and aerial wires were used as a matter of necessity where it was impracticable to bury them. The wire was insulated and laid in lead tubes in sections of sixty feet, and wound upon a drum. A plough designed for the purpose by the present foreman of the shops of the Baltimore and Ohio Railway, made a furrow two inches wide and twenty inches deep, and the wire leading from the drum on the plough, down through the ploughshare, was buried as the plough was drawn along the line of the railway by eight yoke of oxen. As each section of sixty feet was buried, a plumber would solder on a new length of wire. When the stone viaduct at Relay Station was reached, it was out of the question to disturb the masonry for the purpose of burying the wires, and they were strung upon poles, as an expedient suggested by some laborer unknown to fame. In the course of the tests it was found that the insulation could not be maintained on the first section of nine miles of underground wire, and therefore a second line was strung from poles, completing an aerial line for the whole distance. Although that was in 1843, the people along the route made objections similar in spirit to those offered against the early railways in England. By a confusion of terms in the popular mind, phenomena similar to lightning, although conceded to be somewhat less in violence, were anticipated. It was claimed that the birds of the air and beasts of the field would be killed, that buildings would be burnt and property injured — nay, it was even expected that trees and vegetation would be blasted, and nothing could have defended it but the strong, protecting arm of the friendly railroad corporation, which had given to Professor Morse the right of laying the telegraph wire along its right of way, conservatively, in the words of the original vote of the Board of Directors, "Reserving the right of discontinuing its use, if, upon experiment, it should prove in any manner injurious." Looking back at the inexperience of that generation, the wonder is that they allowed Morse any privileges, even carefully-guarded ones. — *Engineering.*

TRADE SURVEYS

Reports received this week from architects in different sections of the country, both from large and small cities, go to strengthen the rather favorable reports concerning business which have been made in this survey from time to time. Its purpose is to not overstate or understate the facts or their significance, but to strike the centre as nearly as is possible. A very large amount of repairing work, or work in the character of repairing and alterations, is to be undertaken early in the season. A great deal of elevator building is to be done. The list of permits will increase from this out, not only for residences but for manufacturing establishments. In the New England and Middle States there is a tendency among manufacturing interests to concentrate. In the Western and Southern States the influences at work are causing a multitude of small establishments to spring up which in time will no doubt be driven by competition and other causes to come into closer harmony. At present, the leaders of these small industries are seeking exceptional advantages, such as is afforded by fuel, nearness to raw material or to consumers and freedom from the exacting conditions which surround manufacturing interests in the more thickly-settled sections of the country. The development of industrial activity is observed in every conceivable direction. A score or more of shoe factories, for instance, are projected in three or four Western States. Furniture factories are also springing up throughout the West, and works for the supply of electrical apparatus are not far behind. Electric-light is called for in scores of towns and it is quite probable that a good many of them will succeed in securing it. The encouragement that has been given during the past six months has started an army of enterprising men with capital, large or small, to seek new opportunities in new localities. This enterprise is laying the foundation of expanding markets for all kinds of material.

The manufacturers of furniture, factory machinery, including all kinds of wood-working machinery, the large foundry establishments, the steel mills, making steel for all kinds of merchantable uses, the manufacturers of flour-milling machinery, and the manufacturers of motive power, of from five to fifty horse-power, have, since January 1st, received a great deal of encouragement in the shape of orders and inquiries for material and appliances to equip new mills and works, or to enlarge existing plants, or to tear out old machinery to be supplanted by improved machinery of a diversified character.

The Northwestern lumber dealers have undertaken to advance the price of lumber from five to ten per cent. The prediction was made months ago that lumber would be twenty per cent higher in the spring than last autumn, and certain alleged reasons were given for the statement. An upward tendency is in progress. The building boom promises to continue another year. The stocks of lumber in primary and secondary markets are far from being troublesome. Last year there was a decrease in pine-lumber production as compared with 1884. The cost of bringing lumber to market is gradually increasing. Stumpage is dearer than two years ago in most localities. It is true that these indications of stronger prices are partially offset by the opening-up of new timber regions, but at the present time the upward tendency has the advantage. Besides this, there is a spirit of combination among lumber dealers which will help to preserve prices against any depression at least. During the past week a great many Western dealers have been in this city, New York and Philadelphia, offering lumber at little higher prices than heretofore. Those who believe lumber will be higher in the spring made purchases, but the majority of buyers have declined to act, preferring to pay the higher price when the time comes, should it be established. Wholesale and retail dealers in all markets have been waiting for favorable weather. Dealers in all our large cities inform us that they have every assurance of an active demand for all kinds of lumber as soon as outside operations can be entered upon with some promised regularity. The Eastern market will buy very heavily of white pine this year, and already contracts for immense amounts have been quietly placed by the few whose action, as soon as discovered, will have the effect of dragging the rank and file, who usually wait for the action of leaders, into the market. Without making any predictions, it seems to be advisable to make more than usual provision for the requirements for the next ninety days. A quick revival of trade in the lumber trade is looked for in all markets. The increasing consumption of hardwood for house and shop building purposes has led to negotiations for timber territory in new sections easily reached by railroad. Makers of saw-mill machinery are now busily engaged on contracts for improved mill machinery to be erected in the Virginias and the Carolinas this season. It is indulging in no prediction to say that the consumption of the hardwoods will be increased this year over last, not less than fifteen per cent, and it is also safe to say that by the time the facilities now being established for meeting the increased demand are in working order, the prices of hardwoods will recede — should they be temporarily advanced in the meantime. There is no probability of a permanent upward tendency in lumber because the available supplies are enormous. Whatever improving tendency there is exhibited in the markets is due to the conservative action of the timber and the lumber manufacturing interests.

Following the lumber question, the money question possesses the highest degree of interest to manufacturers, builders and the general business interests more than any others. It will be remembered that a year or two ago the banking interests, with one accord, resolved upon a course of restricting the supply of money for customers' accommodation. It was found by projectors and pioneers in various branches that schemes for borrowing money would not go through. The banking interests came to the conclusion, at that time, that the country was in need of a sort of paternal care, so far as spending money was concerned, and they established very stringent regulations. The result, shortly after the inauguration of this policy, was an increase in the number of failures, and the dropping-off of a good many enterprises that had been seeking assistance. The country may have profited by that policy, more than is apparent, but, whatever the advantage or the disadvantage was, the money-lenders are now relaxing their control, and are meeting the spirit of enterprise halfway. This is due to two causes, first, the dangerous period is passed; and second, the supply of money for loan has considerably increased. Our financial condition is sound; railroad management is improving; a general demand for more houses, more shops, and more machinery exists. The masses are able to produce more values, are able to pay their debts more promptly, and there is, therefore, less risk to the money-lender. The idle capital is tired of its prolonged holiday, and for months past has been running after borrowers, and has not been particular as to the kind of employment it accepts. It is becoming eminently democratic and cosmopolitan, going anywhere and in any quantity it is wanted, and doing its work in enterprise with a success that is drawing fresh supplies in its tracks. In estimating the probable course of trade and of manufacturing, this cause must be kept in sight. It will act very powerfully upon the industries this year.

No changes in prices of building-material are to be noted, and manufacturers of all kinds are preparing an abundant supply, either in actual stock, or by way of more extended facilities for creating stock. The iron and steel industries are prospering. Last week the steel-rail syndicate met and decided not to increase the steel-rail production at present, but received very flattering reports from all sections of the country as to the increasing demand for railway material. The nail-makers met in Philadelphia on Wednesday, and also in Pittsburgh. The steel-makers are fairly supplied with orders, and the inquiries for all kinds of iron and steel products are helping to maintain the firmness in prices which prevailed at the opening of the year. Fresh orders for cars and locomotives were placed during the past week, and the largest locomotive-works in the United States — the Baldwins at Philadelphia — return to full time after a "short day" for over a year.

Employers are in conference in some cities with their workmen with reference to the eight or nine-hour day, which it is proposed to establish. In several places, terms have been arranged for workmen and their employers for a nine-hour day. There is a surprising acquiescence in demands for the restriction. Of course the concessions that have been made are insignificant, but they indicate a willingness, upon the part of builders particularly, to meet the demands of their workmen in advance. The organization of labor is progressing at the rate of three to four hundred organizations per month, that of the Knights of Labor showing an increase alone of three hundred per month. In due time this fever of organization, like all other fevers, will subside. It is in the nature of the dying man grasping at a straw, not that the workingmen's organizations are dying, or that organization is a straw, but organization is seized at with a desperation and an enthusiasm, which shows how urgent is the necessity for relief from the complicated conditions growing out of the modern developments. The labor problem will solve itself harmoniously with the aid of wise legislation.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. NO. 530.

FEBRUARY 20, 1886.

Entered at the Post-Office at Boston as second-class matter.

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THE Board of Health of the town of Syracuse, N. Y., has had the good sense to send copies of the rules by which it proposes to regulate plumbing to the various architects and plumbers of the city, in order that they may criticise them and suggest improvements, before their final adoption. The *Sanitary Engineer*, having received a copy of the circular, prints it at length, together with some comments which the Board will probably find of more value than all the rest that it will receive. It would take too much space to give the rules in full, and we need only advert to some of those about which the *Sanitary Engineer* finds something to say. The first of these refers to the jointing of earthenware drain-pipes, which, as the rule says, must be made " perfectly tight, particularly the lower halves," with freshly-prepared hydraulic mortar. The *Sanitary Engineer* very properly suggests that there should be no difference between the upper and lower halves of a " perfectly tight" joint; and to this we will add that the rule that all joints must be made with freshly-prepared hydraulic mortar is, in our judgment, a mistake. In the first place, " hydraulic mortar " may mean anything, from ground lime to the inert substances sold in country stores as hydraulic cement, so that a definition of the quality and kind of " mortar " to be used would be of much more value than a sweeping rule on the method of mixing it; and in the second place, if Portland cement, which is by far the best material for the purpose, is used, it is better that it should not be " freshly prepared," as the rule demands. On the contrary, fresh-mixed Portland cement may swell in setting so as to break the hub of the pipe, and, at best, it is less readily managed, and makes a weaker and poorer joint in this condition than after it has gone through the process of mixing, standing for twenty-four hours, and re-tempering, which the document, in the next clause, expressly forbids.

THE next clause to which the *Sanitary Engineer* takes exception is one requiring soil-pipes above the roof to be covered with a ventilating-cap. It is singular that the tinman's superstition about ventilating-caps on soil-pipes should have persisted so long among intelligent people. It must now be about ten years since an official commission, after testing all the ventilating-caps of reputation on top of an open pipe, reported that there was not one which did not obstruct, instead of facilitating the current through the pipe; but, although this report has been republished and quoted a thousand times, it seems to be completely ignored in most of the Board-of-Health regulations which have come under our notice. Another curious rule, which the *Sanitary Engineer* forgets to notice, is to the effect that every slop-hopper shall have " a cast-iron trap below the bell-trap, and, if outside house walls, below frost-line," this trap to be ventilated by a pipe running to some place not specified. In our opinion a slop-hopper, unless of porcelain, and provided with a flushing-rim, is an unmitigated and filthy nuisance, which should never be permitted in a house; but it would be hard to devise any means of increasing the stench from it to a dangerous point more effectual than compliance with this regulation, under which it is made compulsory to double-trap the waste from the hopper in such a way that whenever a pail of slops is poured down, the vapors from the filth lying in the lower trap, and lining the sides of the pipe leading to it, which have been festering in the confined space between the two traps since the hopper was last used, are obliged to bubble back into the room through the bell-trap.

ONE other regulation, which seems to be becoming common in Board-of-Health rules, demands that a pipe " shall be run from beneath seat of water-closet up above highest point of roof." " This ventilating-pipe," the document continues, " may run near chimney for heat, but is not to open into chimney or soil-pipe, or to end above roof near window, opening of chimney top, or ventilating shaft." It is needless to say that this rule is founded upon an imperfect knowledge of some of the examples of under-seat ventilation of water-closets, where a forced draught was available, colored by a confusion of ideas between the water-closet bowl and the soil-pipe; and it is equally needless to say, to any one who has had any experience in such matters, that under-seat ventilation of the sort here specified is utterly aud absurdly useless. We do not wish to disparage the value of such ventilation where it is carried out by proper means; on the contrary, we know of buildings where every one of the fifteen or twenty water-closets, to say nothing of the basins and urinals has a current of air rushing downward through it which will carry a piece of paper out of sight in an instant, and will remove all the air of the room in which it stands in less than a minute and a half; and plumbing work so arranged we believe to be the best and safest that can be put into a building, but to try to get such results with little sheet-iron pipes in dwelling-houses is simply useless. Even a gas-flame, as ordinarily applied to such pipes, is of no practical help. Nothing short of a heated flue, or a pipe with a large Argand-burner in it, is capable of producing a down-draught of any value in a water-closet bowl at ordinary seasons, and without such artificial assistance to the current a ventilating pipe from the basin is either inert, or, in winter, becomes a conduit for cold air from the outside, which blows out of the basin around the room. The fact is that the need of any under-seat ventilation for house closets is very slight. Few houses contain more than one or two closets, which are generally used with care, and frequently washed, if the closet is so poor in pattern as not to wash itself out. When not in use, they are therefore, or should be, as inoffensive as a bowl of clean water, and the only time when they should require ventilation from the bowl is during a few moments each day, the average amount of offence being much less, during twenty-four hours, than that due to the vapors of decomposing soap which rise from the waste of a wash-bowl, between the strainer and the trap. No authorities think it necessary to provide appliances for carrying off the soapy smell from the wash-bowl, and a good water-closet, kept clean, and properly used, is less to be feared than a wash-bowl; while a bad closet, or a dirty or ill-used one, could not be prevented from diffusing its foul odors by anything short of a forced ventilation which is impracticable in a dwelling-house. If any one wishes to try to ventilate his closet bowls, there is certainly no objection, but as the air which he will remove, if he succeeds in his efforts, is, or ought to be, neither more nor less offensive than the average air of his house, there is no reason whatever for forbidding him to carry it away by a chimney flue, or to discharge it near any other flue or shaft.

THE *Deutsche Bauzeitung* publishes quite promptly its annual list of the theatres burned during the last year, and calls attention to the fact that the list is a very short one, owing, as it thinks, to the stringent regulations in regard to the construction and management of theatres which have been generally established since the terrible Ring-Theatre fire. The first fire was on the ninth of February, when a theatre in Exeter was totally destroyed. On the twenty-seventh of February the National Theatre in Washington took fire, for the fourth time in its history, and was burned; and one month later the Buffalo Music-Hall was destroyed. On the twentieth of April a wooden circus-building at Richmond was burned, and many persons injured. The next day the Renaissance Theatre in " Nawes," a place which we never heard of before, was burned, and twenty-four hours after a new theatre in Szegedin, in Hungary. On the eleventh of June two theatres were burned, one at Woolwich in England, and the other in San Francisco, the latter being the celebrated Chinese theatre. In October

the new Eden Theatre in Antwerp was destroyed; and on the sixth of December the German Theatre at Moscow. As compared with the previous years this is a very favorable showing. In 1882, twenty-five theatres were burned; in 1883, twenty-two; in 1884, ten; and in 1885, ten.

THE city of Naples has at last secured, what it has sorely needed for more than a thousand years, an adequate supply of water; and the *Schweizerische Bauzeitung* gives an interesting description of the engineering works by which it is brought to the city. It seems from the account that until now Naples and the neighboring villages have been far less favored in this respect than they were in ancient times, for considerable portions still remain of an aqueduct supposed to have been constructed by the Samnites, more than two thousand years ago, bringing water from the valley of the river Sebato, in the mountains some thirty-five or forty miles away to the eastward; and another aqueduct, built under Claudius or Nero, two or three hundred years later, and supplying the towns all along the neighboring coast, is still in such good condition that it was seriously intended, until within a few years, to repair it for another term of service. In 1866, a commission was appointed by the city to examine the ground and report upon the best means of obtaining a supply of water; and after consultation with the most noted experts it was decided that, although the repairing of the Roman aqueduct would be inexpedient, the springs from which it drew its supply should be utilized, and the water brought thence by a shorter route, through the inverted siphons which modern engineers regard so much more favorably than their Roman brethren did. Projects were then invited from different contracting companies, and a contract was made with the "Naples Water-works Company," representing two great French corporations, the *Compagnie Générale des Eaux*, and the *Compagnie des Eaux pour l'Etranger*, both of Paris.

THE first work needed was the diversion of a mountain torrent, which in rainy weather mixed with the clear water of the springs which it was desired to use. This was accomplished by building a watertight channel of stone and concrete, through which the torrent might be safely carried away on occasion; and three collecting-basins were then sunk in the water-bearing soil of the valley. Three important springs come to the surface in the valley, two of which were used by the Romans. The third supplies the present aqueduct with all the water that is now needed, but the others could easily be added to the supply if necessary. From the collecting-basins an aqueduct of masonry, built with a uniform fall of one in two thousand, leads the water to the hill of Cancello, overlooking the city. So far, the course of the aqueduct is very tortuous, owing to the necessity for keeping very nearly a contour line; and its length is about thirty-two miles. Between the Cancello hill and the elevation on which the city of Naples is built extends a low plain, which must be crossed by inverted siphons of iron pipe, and by a wise forethought two of these are employed in such a way that the higher portions of the town may enjoy their water-supply independent of the inhabitants of the lower portions. To accomplish this the water from the aqueduct is led first into a high-service reservoir situated near the top of the Cancello hill, from which the pipe is taken, which supplies the upper portions of Naples. After the high-service reservoir is full, the overflow runs by a subterranean channel into a low-service reservoir placed farther down the hill, from which the system of pipes for the lower parts of the city is supplied. The quantity of water flowing through the aqueduct is much greater than that consumed, so that about half of it runs to waste over the plain; and there is no danger that either service will fall short of its supply; but for precaution the high-service pipes in the city are in certain places, carried into small reservoirs communicating with the low-service pipes, and situated nearly at the same level with the low-service reservoir on the Cancello hill, so that in case of accident to the low-service siphon the whole city can be supplied from the other.

LA *Revue Industrielle* makes some useful observations on wood-working machines in two of its recent issues. Among other things, it speaks of the band-saw as one of the most useful of machine tools, but says that its tendency to break has made it of less service than it would otherwise be. It seems, however, that this disposition of band-saws to break may be modified, if not entirely cured, by fitting them up with very light pulleys, made with wire spokes like those of bicycles. The ordinary cause of the breaking of a saw-blade is the sudden checking of its movement by a knot in the wood it is cutting, or the wedging of a particle of sawdust in the cut. When this happens, the lower pulley is held back by the dragging of the saw, and turns more slowly, while the momentum of the upper one throws it over at the usual speed, and the saw is thus tightly strained on the side farthest from the cut, and slackened, and violently agitated, on the working side. The shaking caused in this way frequently snaps the steel blade, and everything that diminishes the *vis viva* of the pulleys helps to assimilate their movement to that of the saw, and lessen the chances of shaking and snapping by unequal strains. By using wire spokes, a strong pulley, two feet in diameter, can be made with a weight of a little over twelve pounds, and a three-foot pulley can be made with something more than twenty pounds of metal. On these pulleys a saw will run a long time without danger of breaking. Another improvement noticed is a modification in grindstones and emery wheels, by which the wheel is given a reciprocating lateral motion in addition to its rotation. Every one has noticed the advantage of moving a tool from side to side on a hand grindstone, so as to equalize the attrition on the different parts of the edge; and it is found that by making the grindstone move, and keeping the tool still, a more perfect result is obtained, while the detached particles of steel have an opportunity to drop off the grindstone, instead of being crushed into it, and the wear of the stone, and the heating of the tool, are both greatly diminished.

ACCORDING to the *Revue Industrielle*, several coal-mines in Hungary have already been excavated to a depth of three-fifths of a mile from the surface, and are being constantly carried to still greater depths; aud the question has already arisen whether it will be possible with the machinery now in use to hoist the coal from the bottom of the shafts to the surface. An Austrian physicist has made some experiments to determine this point, and has concluded that twelve hundred metres, or three-quarters of a mile, is the greatest depth from which coal baskets can be safely lifted by means of any sort of hoisting rope or cable now known; and he advises that where shafts are to be carried to this or a greater depth an enlargement should be made, about half-way down, large enough to accommodate a platform, which should serve as a resting place for the coal baskets. These could be hoisted to the platform by means of the usual endless rope, and deposited there, and another rope, let down from the mouth of the shaft, could then take them and bring them safely to the surface.

THE *Sanitary Plumber* tells a story which may contain a little moral for those who think it is economical to undertake important public works upon the advice of cheap experts or amateurs. It appears that the City Council of Atlanta, Ga., having apparently heard something somewhere about artesian wells, concluded that it would be an excellent thing to have one of them to eke out the city water supply, and accordingly engaged a certain "Colonel" of the neighborhood to bore one. The military man bored away with enthusiasm as long as the city authorities supplied money, and by the time he had absorbed twenty-six thousand dollars the well had reached a depth of two thousand feet. It is not certain whether the patience or the money of the City Council gave out first, but at this point, no sign having yet appeared of the fountain of water which they apparently imagined to be the characteristic of an artesian well, they ordered the work stopped, and, after the usual fashion of public bodies, sent for a geologist to explain to them why their well did not behave as they expected it to. The geologist did not need even to look at the place to inform them that, as Atlanta stood on the granite formation, the "bed-rock of the continent," as he called it, no flowing artesian well could, by any possibility, be made in or near the city. The little water collected in the well he explained to be derived from the percolation of the surface-water into the excavation through seams in the rock, and he gave them the wise advice to be careful about using it. As just as much surface-water, of a much better quality, would probably be collected by a cistern costing a few hundred dollars, the people of Atlanta are now, we suppose, congratulating themselves on having acquired for twenty-five thousand dollars, information which they might have obtained at any time for five or ten dollars. As usual, the doctors do not agree, for there are other geologists who say that the bed-rock has not been reached, and that continued boring will make the well a success.

SITTING STATUES. — I.

GOVERNOR BUCKINGHAM.



"History," by Paul Dubois. From the Lamoriciere Monument, Nantes, France.

THE sitting statue, in bronze, of the late Governor William A. Buckingham, of Connecticut, was unveiled in the Capitol, at Hartford, June 18, 1884. It was made for the State by Mr. Olin L. Warner, of New York.

It has often been asserted, sometimes with great truth and propriety, that the circumstances under which a work of art is made should be considered, in order to form a just judgment of its merits. This seems to us especially true in regard to the Buckingham statue.

We believe that, from an art point of view, no American sculptor has ever received a commission for a public statue, previous to that given to Warner for this one, from the fulfilment of which so much was expected. To the artists of New York and Boston, especially to those of the younger generation, and to the principal lovers of art in those cities, he had been known, for several years before 1882, as the author of various busts and medallions of unusual merit, as an artist of rare perceptions, of exceptional loyalty to the highest views of art, and as a sculptor who gave every apparent promise of satisfying the most enthusiastic hopes, whenever he should be called upon to execute large and important work.

Warner arrived in New York in 1872 from Paris, where he had been studying his profession, and from that time until 1882, he received no public and very little private recognition, so far as work was concerned. During the five years previous to the latter date, he began to attract attention by his busts of J. Alden Weir, Miss Morgan, and Daniel Cottier, the statuette of "Twilight," and by many medallions. The best artists greeted these works with warm appreciation. In the Cottier bust there was a sensuousness of touch, a simple, individual style of modelling, and a faculty of reproducing in clay the impression of a person's head, that was entirely unknown in American sculpture. It was at once seen to be a genuine art impression in form, and it established the belief beyond a doubt that its author possessed the temperament of a veritable artist. It may be safely asserted that no other American sculptor had made a bust possessing so many of the qualities of pure art as this one. It was also observed that Warner's work showed a continued progress from the time of his arrival in New York until 1883, and this was further confirmed by the appearance in that year of the Blair bust, which, in boldness of character and fullness of impression, was superior to anything he had yet executed.



Statue of Corneille, by Falguiere, for the Theatre Francais.

If no very noticeable indications of the qualities of imagination or composition were seen in Warner's work, it was evident that he was loyal to the impressions of his subject, and depended entirely upon what he could get out of that, being tempted by no weakness or affectation in the employment of unnecessary accessories in the way of decorative letters, the undue prominence of his own name, or the fancy effects of the professional modeller. He imitated no style of working, copied no obsolete custom of decoration, nor trusted to the effect of ornament to make up for lack of character. His busts were generally arranged in good taste, and looked as though they belonged to a human body, and were not heads of beings that had no bodies, as is the case with most of the busts by American sculptors. His treatment of a bust or medallion was his own — sensible, respectful, modest and artistic.

Some singularly interesting and significant facts of the life he had led before he came to New York, were regarded by those who *knew* him best, as the legitimate origin of the reputation he had since gained in New York and Boston. These facts were: a clear understanding, at an early age, of what he must do to become a sculptor; an uncommon determination and perseverance in carrying out his purposes through many and various difficulties; and the favorable influences under which he fell on his arrival in Paris to begin his studies. He was fortunate enough to find a place in the studio of two young and struggling Parisian sculptors, who have since become successful, and who were glad to prepare him to enter the Government School of Fine Arts, which he did after nine months of preliminary study. We believe that no American sculptor who had studied in Europe before Warner had so thoroughly identified himself with, and enjoyed to such an extent, the best facilities that Europe affords to students of art. The significance of this fact must be credited to the superior tendencies of his artistic nature, which led him to choose to study in Paris rather than in Italy, for it may be stated in this connection that, with the exception of Rinehart, of Baltimore, not a single American who has chosen Italy has ever distinguished himself among artists, either as a student or as a professional sculptor. Warner was also fortunate in the professor under whom he studied in the Government school. The career of Père Jouffroy as a teacher of sculpture is without a parallel in the history of French art; for more fine sculptors have graduated from his atelier than from all the other ateliers that are connected with the school. With such a teacher and among such students Warner had the happiness of pursuing his studies. He had all that could be desired as a student, as well as the best of opportunities to form valuable professional relationships. The latter came in due time, for Carpeaux, the greatest of decorative sculptors then living, gave the young American some simple work, and offered him continuous employment. No higher tribute could have been paid to Warner, as a student, than this which he received from the great Frenchman. Slight as it may have been when considered from a Parisian point of view, it was yet a great deal from an American point of view, as no other student of sculpture from this country had ever received it.

Warner, however, declined the invitation, and decided to go home to the United States; a decision that caused surprise and regret to his comrades, for they believed that it would be not only the best thing he could do to accept the invitation, in order to successfully continue his studies, and eventually enable him to earn his living among the best sculptors, but it would enable him to enjoy what is so needful to an artist — the sympathetic surroundings that Paris so abundantly affords; and in addition to this, they desired, with true professional kindness, that he should, by so doing, forever escape the discouragements they were sure would befall him if he returned to his own country.

Warner's exceptional student life and experience in Paris, combined with the reputation he had gained while in New York, seemed certainly to indicate that we had at last a sculptor who could make, not perhaps a masterpiece nor a remarkable statue, nor as good a one as his fellow-students in Paris, who had been able to continue their studies without interruption, but still a much better statue than any American had made, and one that would show unmistakably the stamp of the comprehensive artist and ambitious student. In short, that we should find in his work at least the first rudimentary principles of good sculpture, like those seen in his busts.

With this enviable record to recommend him, and the warm and

earnest words of praise from those who knew him, he was invited by a committee of the Legislature of Connecticut to enter the competition for the Buckingham statue, with several other American sculptors of long-established reputation in their own country. The contest resulted in his receiving the commission, and every one who knew him rejoiced that, after ten years of public neglect, he was at last given an opportunity to make a public statue, and, what was still more satisfactory, to make it for the State in which he was born.

An added interest to these favoring circumstances was presented in the fact that a representative statue, that of General Israel Putnam, by Mr. J. Q. A. Ward, was in the Park, at Hartford, and situated but a few hundred yards from the spot where the Buckingham would be placed, thus affording an excellent opportunity to compare the work of the two sculptors. Ward has been regarded for many years, by a large and influential body of admirers, and by the public generally, as the most successful, popular and "thoroughly American sculptor." This regard has grown out of the claimed superiority of his work over that made by our sculptors in Italy; the fact that he has always been fully employed upon important public statues, for which he has received larger prices than any other American sculptor; and that his professional acquirements have been wholly gained without study in Europe. His success has been constantly pointed to as an illustration of what an American sculptor can do without foreign study, and as an unanswerable argument that such study is unnecessary. His example is set up as a reproof to those of his countrymen who have sought the facilities offered to art-students in Europe, and have not met with public recognition or his success. As a fitting appreciation of his success, loyalty to nationality, and superior ability, Ward has been acclaimed by his friends "the Michael Angelo of America." We believe he was one of the competitors for the Buckingham statue. At any rate, the unknown, unsuccessful, and unfortunate student of foreign schools was now to be, in his forthcoming statue, a permanent competitor for public approbation, against an ever-conquering rival, the accepted representative of all that was best in American sculpture, and the acclaimed successor of the art-god of the Renaissance.

Unexpectedly to some of Warner's friends, there immediately arose with him, at the time of his receiving the order for the statue, the question as to whether he would execute it in Paris or in New York; for they supposed that, as a matter of course, from his inexperience of large work, from the lack of proper facilities for its successful execution in this country, and from his knowledge of the superior advantages to be found in Paris, he would go there to make the statue. Besides, they thought that his all-absorbing desire, his sole ambition, was to resume the studies he had discontinued in 1872; and especially, now that he could work for the great aim of producing a good statue, and meeting, for the first time in his life, a high professional responsibility. They therefore urgently advised him to go to Paris at once, and not neglect any opportunity that could in any way contribute to the success of his work, extend his knowledge and add to his power as a sculptor. They even ventured to remind him of his inexperience, the peculiar necessity in his case of putting forth every effort, of the rare and desirable conditions that would surround him among his old and successful associates, and the needed and inestimable criticisms they, and other and greater sculptors, would gladly give him. Other advisers counselled him to make his statue in New York, with whatever facilities he could find there, and which they considered good enough; to save the time and expense of going to Paris; to do it as quickly as possible, and to gain what was of the highest import in American public estimation, the approbation given to other sculptors who had not found it necessary for their success to study abroad. Without at once deciding which course to follow, Warner made a visit to the principal art centres of Europe to study especially the famous sitting statues. Before returning to America he spent a few days in Paris, among the associates of his student life, and there decided to make his statue in New York, and depend entirely upon his own resources.

To the public, and especially to his artist friends, the question of present interest is, what has Warner accomplished in the Buckingham statute?

The material he had to work with was confined to photographs, in sufficient number and variety to give an excellent and forcible idea and impression of the physical and mental character of the man he was to reproduce in sculpture: a business man of decided individuality, whose movements and actions, whether in private life, or performing the important executive duties of a governor of a state in times of civil war, were alike definite, decided, ready, and characteristic.

The first impression that the statue makes upon the observer is, that the sculptor paid no attention whatever to the individuality of Buckingham as shown by his photographs, or to any mental or ethnological facts concerning him, or to any illustrative action, movement or event that would fitly represent the man, or the Governor; that he has made no allusion to any distinct phase of the representative personality of the chief officer of a State, but that he placed a model in a chair, in a position that he thought the Governor *ought* to take, and then tried to copy him, putting the Governor's head on the model's figure, as a sufficient identification of what the statue was intended to be.

It appears then that at the very first point in the consideration of a portrait statue, and that point, which is regarded in sculpture as he vital basis upon which such a statue is conceived, Warner has shown the completest indifference; and in its place he has tried to reproduce the form of a person of a totally different type. There is only one thing that could neutralize this indifference to the absolute exaction of art in the matter of loyalty to the individuality of his subject, only one thing that the sculptor could put in the place of a *portrait* statue of Buckingham, and that is a work of art so excellent that everything concerning persons and events, however important, become, in comparison, uninteresting and indifferent. An imaginative statue, in short, like one of those made by Michael Angelo.

Having been thus indifferent to all that concerned his subject, what kind of a person has the sculptor presented to us? A common, if not vulgar man, who does not know how to sit, whose movements are stiff, whose articulations are coarse and ungainly, whose hands are characterless, and whose feet are repulsive. And this is what is called a statue of William A. Buckingham, the War Governor of Connecticut!

Who would ever have believed that the delicate and fastidious artist who modelled the bust of Miss Morgan, who touched into surprising existence the impression of Daniel Cottier, and commanded the bold Blair to come forth, was the blind sculptor of muddled sensibility who made this piece of bronze for a New England gentleman? It would be difficult to find a worse example of such bad taste and poor judgment, even in the crude practices of the commercial sculptor of soldiers' monuments, as Warner has displayed in the selection of a model for this statue. From no point of view does it show that he had the slightest idea of any of the distinctive elements of a statue, either illustrative or imaginative. In its composition the statue gives the impression of simplicity, but of meaningless simplicity. It will answer to one name as well as to another. He has been content to present a weak reproduction of his model in a fairly unobtrusive though not easy position, for him; — for simple as the position is it is one foreign to the coarse, awkward nature of such a model.

If the statue represents anything, it is a cold, unapproachable, and dissatisfied person, who gives no indication of having ever accomplished, or who proposes to accomplish, anything, except to repel those who enter his presence. As a piece of modelling, the Buckingham is by no means so good as the work he has done on his busts and medallions. In many places it is careless and thoughtless, in others shamefully weak. The whole statue has the air of confident excellence, as though whatever the sculptor did *must* be good. Careless modelling of drapery or flesh, though more agreeable to the eye than the cast-iron rigidity of the untrained and mechanical modeller, is not good art, or worthy of those who can do better. There is no apology to offer for Warner in his failure to model this statue better than anything he had previously done. The difficulty he experienced in arranging his model is unpleasantly evident, especially in the position of the right leg as seen from the left. The inside of this leg, the part around the ankle, and the foot, would be discreditable to the workmen that make granite soldiers.

If the successful composition of a simple sitting figure is difficult, the addition of a chair makes it much more so. In the Buckingham the chair is a good enough piece of furniture, but as a part of the composition, it is too large and too heavy, and instead of being kept in its place as a help to the figure, it is antagonistic to it, and a dominating element of the composition, giving the impression that the figure was made for the chair. The chair-arms perform the important duty of supporting both arms of the statue, which appear to have nothing else to do but to be thus kindly cared for.

We have said that the model who posed for this statue did not know how to sit, and we now add that the statue itself gives no indication of resting itself on, or being supported by its haunches. It is in a sitting position only because the legs and body describe the angle of such a position, but not because of the sense of weight, or of any defined physical or constructive fact indicated by this angle. The only indication that the statue gives that it sits, or has any composite relation with the chair, is seen at the lower points of the shoulder-blades. At these points the body of the statue touches the back of the chair, and from them the strained creases and folds of the coat start on their meagre way downward toward the lumbar region. Figures that sit well and solidly give other and more decided evidence of that distinguishing fact. T. H. Bartlett.

[To be continued.]

Frozen Ground Deep Down.— Scientific men have been perplexed for many years over the phenomenon of a certain well at Yakutsk, Siberia. A Russian merchant in 1828 began to dig the well, but he gave up the task three years later, when he had dug down thirty feet and was still in solidly-frozen soil. Then the Russian Academy of Sciences dug away at the well for months, but stopped when it had reached a depth of 382 feet, when the ground was still frozen as hard as a rock. In 1844 the Academy had the temperature of the excavation carefully taken at various depths, and from these data it was estimated that the ground was frozen to a depth of 612 feet. Although the pole of the greatest cold is in this province of Yakutsk, not even the terrible severity of the Siberian winter could freeze the ground to a depth of 600 feet. Geologists have decided that the frozen valley of the lower Lena is a formation of the glacial period. They believe, in short, that it froze solidly then and has never since had a chance to thaw out.— *Exchange.*

PICTURES OF THE SEASON IN NEW YORK. — I.

THE earlier months of the winter were marked by no artistic events of exceptional interest; yet, as always, many good things awaited those who had time and patience to search the exhibition-rooms and the dealers' galleries.

The autumn show at the Academy was as poor as formerly, or poorer. It made no pretence to fulfil the aim with which such exhibitions, I believe, were instituted. It was not a collection of studies and sketches, illustrative of the artists' summer work-in-idleness, but was simply the same sort of thing as the spring exhibition, only worse in quality. Apart from a serious and interesting, but not wholly successful picture of Maine fishermen by Mr. Homer, a very charming and wholly successful fantasy by Mr. Church, and a really superb little New England landscape by Mr. Inness, there was nothing to detain one's foot in its wearisome pilgrimage from room to room. There has since been an exhibition of the late Governor Morgan's collection in the same gallery, which attracted many through their belief that it was the famous Morgan collection which had been so loudly heralded as the best ever brought together in America. But it was not, and its contents were of the dryest and dreariest quality. *The* Morgan collection will first be shown on the 11th of February, and will undoubtedly prove the most important feature of the year's artistic history.

Certain other private collections have been displayed in advance of their dispersion at the American Art Galleries (which, by the way, have been greatly enlarged and converted by Mr. Edwards-Ficken's clever hands into the most sumptuous as well as convenient interior of the kind which it has ever been my fortune to see in any land); but none of them were of sufficient interest to deserve posthumous chronicling here.

Nor need very much be said about a large and varied collection of American works which was shown in the same place about two months ago. It included a long list of water-colors by Mr. Richards, which, as usual, were very careful and faithful, and some of which had distinct artistic value as well; a number of paintings by American artists abroad, many of which were clever, of course, but none of which save Mr. Harrison's marines seemed to me in any way remarkable; and the "Prize Exhibition of American Water-Colors." This last must have been disappointing to those who knew what American aquarellists can do and who believed in the efficacy of prizes to call out their best results. Certainly there were many good works upon the wall, but as certainly not very many that were very good. Mr. Ross Turner was as delightful as ever, and Mr. Childe Hassam revealed a personality (new to me, at least) of much individuality and an executive skill that was almost entirely equal to his ambitious intents. Faulty though it was in the characterization of the figures, and rather crude though it was in color, his large drawing of the Public Garden in Boston on a sunny spring day showed qualities of drawing, of feeling, and, especially, qualities in the rendering of light which may justify us in hoping that still more admirable results will follow from his hand. Had I deposited a vote for the first prize, it would certainly have been given to this picture; but the public at large felt differently, and the reward went to a marine by Mr. Rehn, undoubtedly an excellent though not a very individual piece of work.

The last exhibition held at the American Art Gallery has also been composite in character. It embraced the architectural drawings which have already been noticed in these columns by a far more competent hand than mine; a long series of water-colors by Mr. Rehn, no other one of which was at all equal to the prize picture just noted; and the annual exhibition of the Salamagundi Club and the American Black-and-White Society.

Once again I must say that while there was much fairly good and some very good work to be noted, there was little of superlative excellence or of such marked originality as to be interesting in spite of possible defects. Two long series of illustrative drawings — one devoted to the "Idylls of the King," by Mr. Kappes, and one to Goldsmith's "Hermit," by Mr. Shirlaw, were conspicuous. But the former seemed to me quite devoid of attraction of any sort, and the latter, though it had much decorative prettiness, and a certain vague, complicated grace of general effect, failed in the rendering of definite ideas, and was almost *baroque* in its mannerisms. Yet it proved Mr. Shirlaw to be an artist, which is more than one can say of many analogous efforts.

A charming little black-and-white water-color (if I may use such an expression) by Mr. Ross Turner; some landscapes by Mr. C. Warren Eaton; and some delightful little pencil sketches by Mr. George Smillie deserve a word in passing. But as a whole the exhibition was by no means very interesting, save as showing a vast advance in the average of our technical skill above the average of even a few years ago.

The annual water-color exhibition at the Academy, and the Society of American Etchers' exhibition, which, as usual, is being shown in connection with it, I shall hope to speak of at a future day. Meanwhile I may say a word or two about what the dealers have had to offer us; and first with regard to American pictures.

At the Reichard Gallery there have been several small but most interesting collections. Mr. Homer, one of those rare and therefore doubly delightful artists who is always doing something new, left the fogs of Maine last winter to seek for sun and color in the southern seas, and showed, by a series of some forty water-colors, painted in Cuba and the Bahama Islands, that he had not only found color and sunshine indeed, but had found a new-born power of rendering them. Perhaps it is needless for me to say that color was once his weakest point (though *weak* is hardly the word to use of Mr. Homer's efforts even when they are not wholly successful) and had never been the strongest point, that is to say the first main quality in any of his results. Even in the famous and thrice admirable series of English fish-wife pictures which he exhibited some two years ago, the color, while often extremely beautiful, did not strike one as being the main beauty, did not seem to have been the chief thing which had attracted the artist's eye and inspired his brush. This thing seemed to have been beauty of form; and beauty of form — beauty of line, of composition, of arrangement in general — was, together with strength of expressional force and individuality of sentiment, certainly the quality which first took one's eye and most profoundly excited one's admiration.

But in these Southern sketches the case stood otherwise. Color was their most pronounced quality and was rendered with a vividness and strength, a frankness and yet a harmony which gave us new cause to marvel at Mr. Homer's great talent in the first place, and then at the steady, persistent, catholic way in which he has applied himself to its development. Here at least is one artist who, though no longer a young man, has never got into those "ruts" either of feeling or of execution which have been fatally attractive even to many among our painters who are young among the youngest. It seems strange that we have had to wait so long for some one to sail his artistic bark into these southern seas, which offer, comparatively close at home, all those attractions American artists have gone so far to find: which offer not only light and color in their highest potency, but vegetable forms and architectural items, and, moreover, human types which could not well be more felicitous for him who loves the picturesque as a theme for pictorial treatment. But who ever saw these sketches must have rejoiced that Mr. Homer had been the discoverer, that his version of his theme was given us ere other and less satisfactory versions had made it hackneyed in our eyes — had deprived it of that extrinsic charm of utter novelty which cannot but enhance its intrinsic value.

Or perhaps I should have used the future rather than the present tense; for what Mr. Homer showed us here were but his memoranda of travel — mere rapid studies and sketches, not complete pictures like those in the English series; and doubtless he will later elaborate the motives here recorded in as full and varied and complete a fashion as he elaborated those he gathered on the chalk-cliffs of England. Yet, as they stood, we were quite content with them, for studies and sketches — if, like these, they are true and not make-believe ones — have, of course, a peculiar value and attractiveness of their own.

The motives displayed among the half-hundred numbers were very various. I need only note as the most important those which showed the fishers of coral at their work — stretches of bright blue water shot with pink reflections from the submerged coral, white boats filled with dusky figures in gay shreds of raiment, and near the boats a diver or two coming lustrous from the waves, and bearing his rosy tropies in his hand. Nothing, I say, could exceed the vividness and strength of the various tints, the frankness with which they were given, or the boldness with which they were contrasted. Yet the result was as harmonious as it was splendid; and certain other sketches which showed architectural bits or gardens of tropical fruit and flower revealed a surprising delicacy, as well as ardor, in Mr. Homer's new pursuit of potent hues. Some of the diver-pictures revealed, as well, his more familiar power in the grouping of figures and the arrangement of lines. If, I repeat, he ever works up these studies into pictures as complete as he may make from them if he will — then indeed we shall have something supremely delightful in store for us.

At the same gallery were shown, at the same time, the original drawings for Mr. Will H. Low's illustrations to Keats's "*Lamia.*" I think I may suppose the book familiar to those among my readers who care for the best that current art can give them; and I think most of them will agree with me that it is the finest result in the way of illustrative art that any of our countrymen has yet accomplished — as successful, while more ambitious, than Mr. Abbey's illustrations to Herrick (if it is not wrong to compare things essentially so unlike) and far more successful — both intellectually and technically — than Mr. Vedder's "Omar Kayyam." Indeed, we need by no means confine ourselves to American efforts in comparison, and yet may accord this book an almost pre-eminent station in its own class.

But, beautifully executed as are the process reproductions in the volume, no one who has not seen the original drawings can quite

appreciate Mr. Low's achievement. Their much larger size is alone sufficient to reveal his skill more strikingly and more fully; and however faithful a mechanical reproduction may be, something of freshness and individuality always must be lost in the transfer. One great quality to be noted in these drawings is the way in which, while securing that decorative effect for the page considered as a whole which no modern illustrator can neglect, Mr. Low has avoided any apparent search for it, has never sacrificed to its demands either the meaning of his designs or their dignity as works of pictorial art. He is always pictorial first and decorative afterwards — yet always decorative in the completest sense. But great as is this virtue, and great as is also the virtue of faithful and adequate interpretation of the text — which means the existence in the artist of strong, imaginative, poetic power — perhaps the most remarkable because the most unusual virtue to be noted is the pure *beauty* of the designs. Pure beauty, I need hardly say, is somewhat out of fashion with modern art. But, though we may grant that certain other qualities are more vitally important to the modern mind, and more akin to the spirit of modern talent, yet all the same it is as precious a quality as ever; one which we should always desire, if not always demand, even in work where it cannot be the first and foremost aim; and one which, when it is given us in combination with intellectual and emotional meanings, is trebly to be valued because of its very rarity. Not only in tone and color — not only in delicate gradations and oppositions of tints and marvellous realizations of subtile effects of light and shade — were these drawings extremely beautiful; but also in treatment of form and in general arrangement — in line and in composition — and especially I should note that the faces were supremely lovely, for it is in just this point that the average illustrator, and indeed the best of illustrators, is most apt to fall short of what our imagination demands of him. It will be a pity indeed if this series of drawings cannot be bought for one of our public institutions; for quite apart from its illustrative value it has an intrinsic artistic value of the very highest kind.

Among the foreign works which the dealers have recently imported perhaps the most delightful is Jules Bréton's last *Salon* canvas, now to be seen at Goupil's. It is called "Le Dernier Rayon," and shows a couple of young peasants returning in the evening from their daily task, to be met in the farm-yard by a toddling child, whose progress towards them is watched by three figures seated by a spinning wheel — the grandfather and grandmother, and a blonde young girl. The arrangement of light is the main point in the picture. The last-named group is covered by the cold gray shadow of the cottage wall, while the first named is illuminated by the warm red rays of the setting sun. The combination of the two effects with such perfect truth, and yet such perfect pictorial harmony, could hardly, I should say, have been accomplished by any other hand; and scarce any other could so perfectly have rendered the suggested sentiment — could have made it so strong and touching and yet kept it so pure from any taint of sentimentality or theatrical affectation. The attitudes and expressions of the young parents, and still more those of the aged grandparents, are as natural and unforced as they are individual and affecting; and a wonderful skill is shown in the figure of the young girl, whose smiling interest we feel as clearly — seem, indeed, to see as clearly — though only her back and a bit of her cheek are visible. When I was looking at this picture I almost repented me of having written as I did in these columns a few weeks ago with regard to the desirability of our studying English art for its strength and purity of sentiment, as well as French art for its strength and skill of execution. But I am glad to think I was wise enough to note that it is only the newest generation of Frenchmen who are deficient in sentiment, and to cite Jules Bréton as one who still survives from an elder generation. And he does much more than survive — he seems to develop year by year into greater charm of sentiment on the one hand, and greater mastery of technical difficulties on the other. A singularly good example of Bastien-Lepage's power in both these directions has also recently been imported by the same dealers; but I think it has not yet been put on public exhibition.

Very different from these, but extraordinarily clever in its own way, is Mr. Jules Stewart's "Hunt Ball," now to be seen at the Reichard gallery. The artist is an American by birth — or at least by parentage — but a Frenchman by adoption, and a Parisian of the Parisians in his art. Alike in feeling, in subject-matter, and in technique, his work is the incarnation of the latest "realistic" tendency applied to modern life in its most characteristic (because most artificial) phase. As a painter of what the *Figaro* calls "*le hig-lif*" Mr. Stewart has had few equals, and in this present canvas we have the most important of his achievements — as faithful, as sympathetic, and as clever a presentation of a modern ball-room scene as could be put upon canvas. The room is blazing with light and crowded with figures (the scale being about two-thirds life-size), and unusually gorgeous with color, owing to the predominance of red coats over the customary black. The trying illumination and the difficult tints have been managed as frankly as successfully, and there is a most unusual degree of life and individuality in the faces — especially in those of the men, many of which are portraits, while it is probable that with the other sex the painter was thrown back perforce upon the professional model. Yet her identity is skilfully veiled; and one can say of the picture what one cannot often say of such attempts — it looks as though a gentleman had painted it and had painted gentlemen and ladies. The spirit and dash and brilliancy of the scene are admirably given by the spirited, dashing, technical style; and, in short, we can hardly imagine the same thing being done more triumphantly. All that remains to be decided is whether the thing itself were worth doing at all. The answer will depend, of course, upon individual taste more than upon criticism properly so called. But those who believe that the first duty of the modern artist is to paint modern life in that aspect with which he is most familiar, and which, therefore, he can most truthfully and sympathetically interpret, can hardly wish that Mr. Stewart should have painted anything different from this. Certainly it will have an extraordinary documentary value a hundred years from now — revealing, as it does, not only current dress and current customs, but the very spirit of current life in this particular phase. And perhaps then the reproach of "frivolity" will not so often be brought against it as, I find, it is today. Perhaps the theme will not seem any more "frivolous" than will the flirtation of a peasant girl, or the quarrel of a group of village urchins; and its painter will seem more "sincere," will seem to have been more "in earnest with his art," than the painter of these last. At all events it is a pleasure — whatever be the subject, whatever be the intrinsic value of its sentiment — to see a piece of work as frankly accepted and as thoroughly well accomplished as is this. M. G. van Rensselaer.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE STATUES OF CHARITY AND MILITARY COURAGE, NANTES, FRANCE. M. PAUL DUBOIS, SCULPTOR.

These groups, from the base of the famous monument to General Le Moricière, as well as the cuts incorporated in the text of the article on "Sitting Statues," are introduced by the author as an object-lesson in imaginative and illustrative sculpture.

BRONZE STATUES AT HARTFORD, CONN., OF GOVERNOR BUCKINGHAM. MR. OLIN L. WARNER, SCULPTOR; AND OF GENERAL ISRAEL PUTNAM. MR. J. Q. A. WARD, SCULPTOR.

See article on "Sitting Statues" elsewhere in this issue.

HOUSE FOR ROBERT SIMPSON, ESQ., TORONTO, CANADA. MESSRS. LANGLEY & BURKE, ARCHITECTS, TORONTO, CANADA.

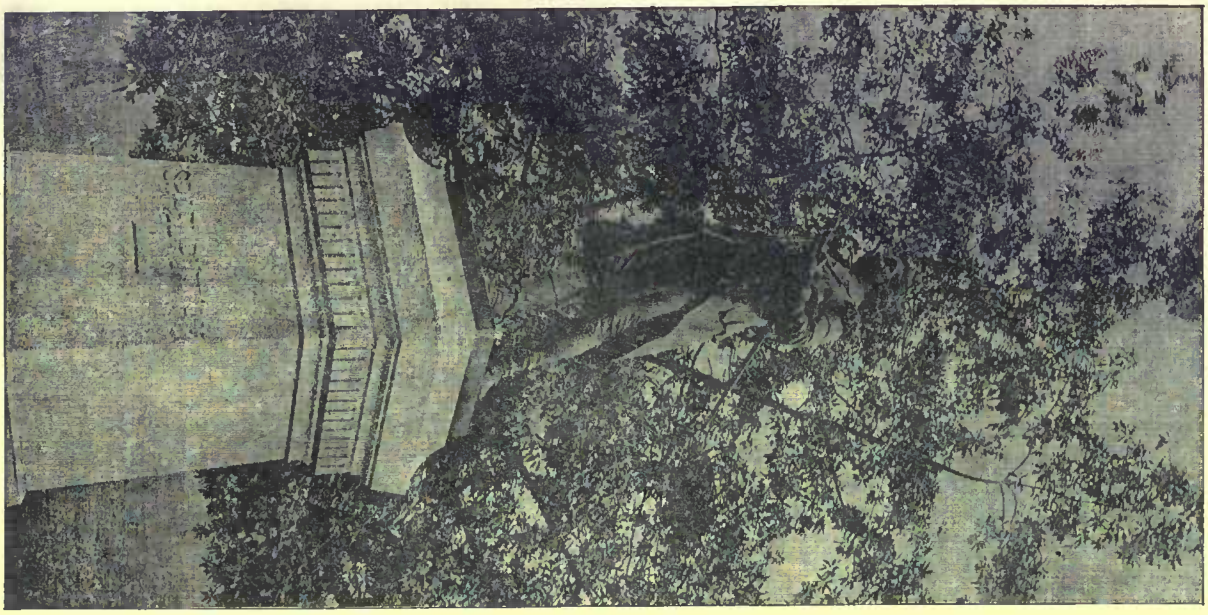
HOUSE AT INTERLAKEN, FLA. MR. E. M. WHEELWRIGHT, ARCHITECT, BOSTON, MASS.

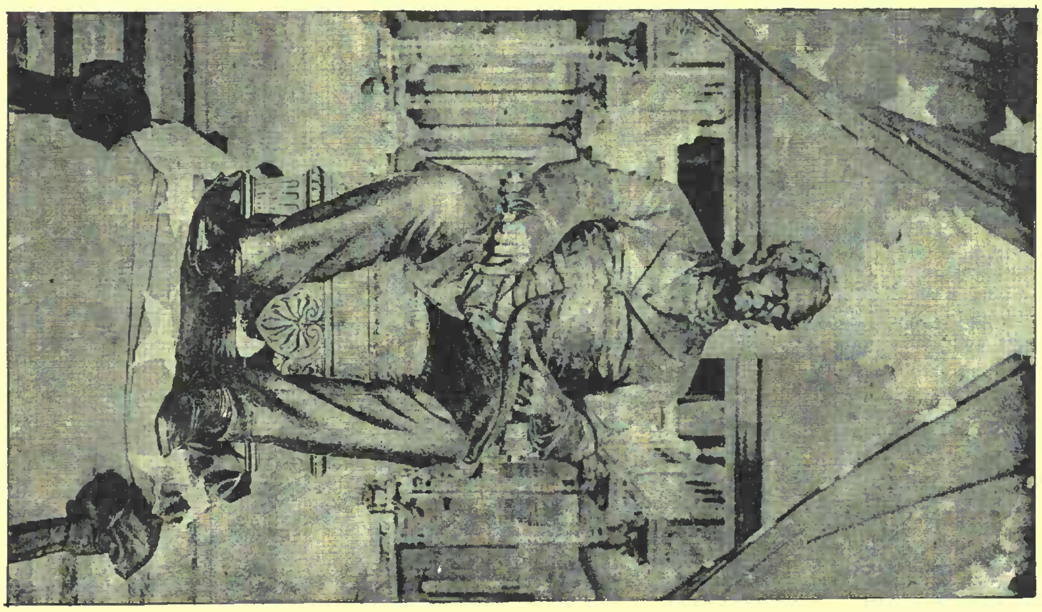
SKETCH FOR IMPROVEMENTS AT BROADWAY AND TWENTY-SECOND STREET, NEW YORK, N. Y. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

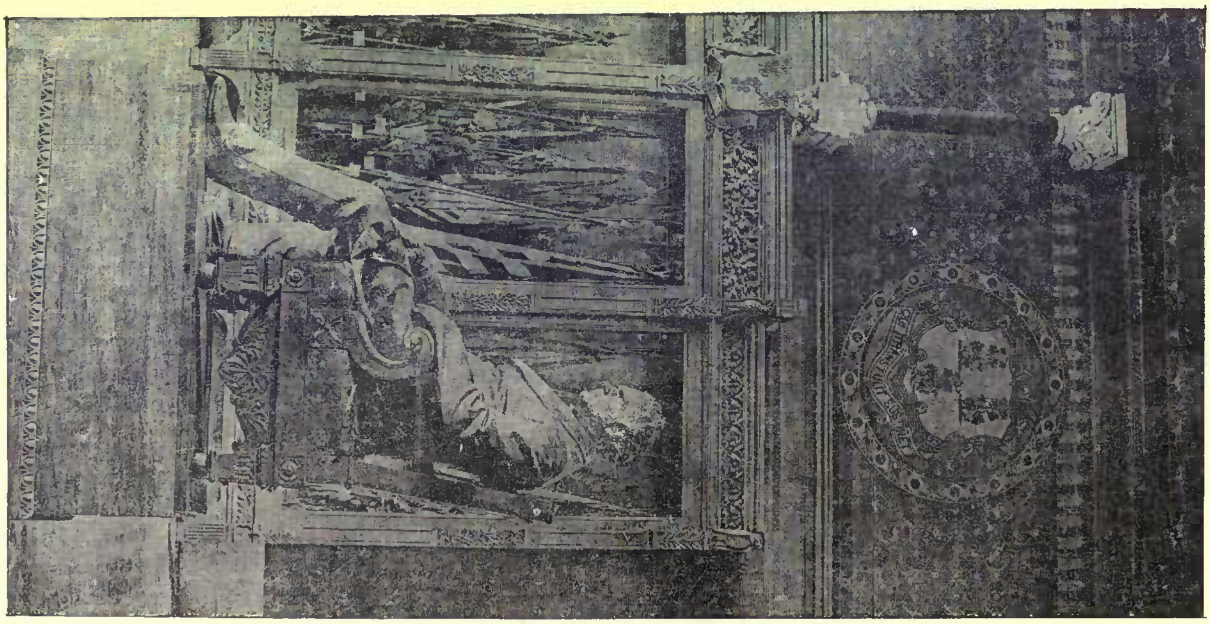
SHOPS OF THE HOBOKEN LAND AND IMPROVEMENT COMPANY, HOBOKEN, N. J. MR. H. EDWARDS-FICKEN, ARCHITECT, NEW YORK, N. Y.

Inquests on Fires. — According to the *Times* it is under consideration by the City Corporation to obtain powers to reintroduce the ancient custom of holding courts of inquiry as to the cause of fires occurring within the city boundary. The subject has been under the consideration of the authorities for some time past, but their attention has been directed towards it more particularly in consequence of the fires the origin of which is "unknown" reaching the high percentage of twenty-five. Formerly the coroners throughout the kingdom held inquest not only upon deaths and fires, but upon burglaries and robberies. Although the practice had been discontinued some four centuries, it was re-introduced in 1845 by Mr. Serjeant Payne, who held altogether some seventy inquiries. The question was much debated as to its legality, and also as to its utility, but it was finally settled in 1860, when Lord Chief Justice Cockburn, Mr. Justice Wightman and Mr. Justice Blackburn decided that the coroner of Manchester had no power to hold inquests on fires, unless it was specially given him by the Legislature. This decision applies to the whole of England except Northumberland, where by custom the holding of inquests on fires has continued without interruption from the earliest times. The principal fire-insurance companies are in favor of the coroner being vested with the additional power, as is also the Metropolitan Board of Works. Captain Shaw, while admitting the desirability of the establishment of fire-inquests, is afraid there are insurmountable difficulties, and among them expense, in the way. At the next meeting of the Court of Common Council a motion recommending the institution of a Royal Commission on the whole subject will be discussed. This subject has been discussed at meetings of the Society of Arts. After the reading of the late Mr. Cornelius Walford's paper on "Destruction of Life and Property by Fire," on February 28, 1883; Mr. Serjeant Payne's letter on fire-inquests was read (see *Journal*, Vol. xxxi., p. 371); and at a meeting held by the Society on May 31, 1883, the following resolution was passed: "That in all cases where serious loss of property has occurred through fire, provision ought to be made for holding an official inquiry by some competent authority." — *Journal of the Society of Arts.*

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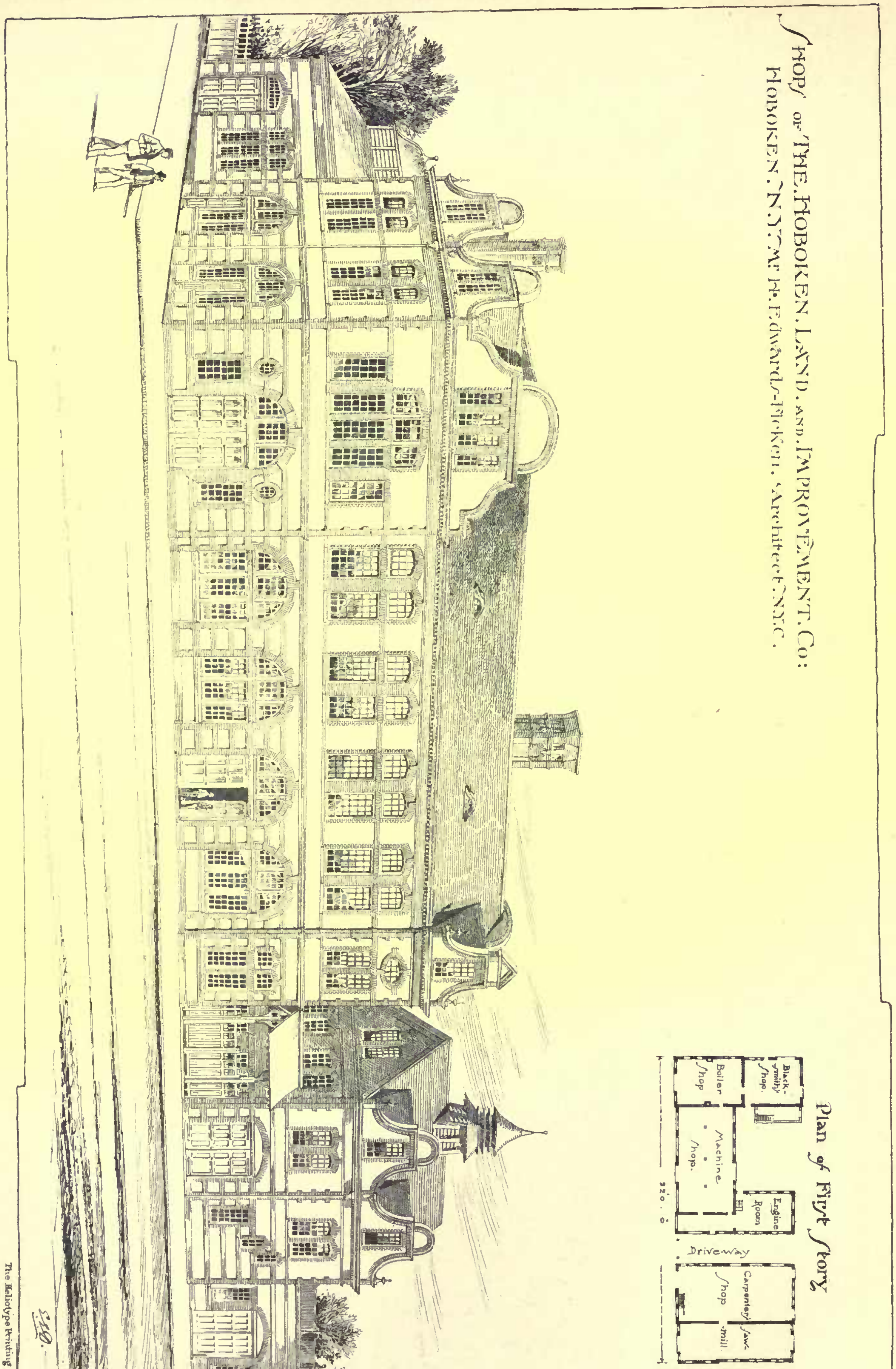




Bronze Statues of Gov. Buckingham and Gen. Putnam: Hartford, Conn. O. L. Warner and J. Q. A. Ward, Sculptors.

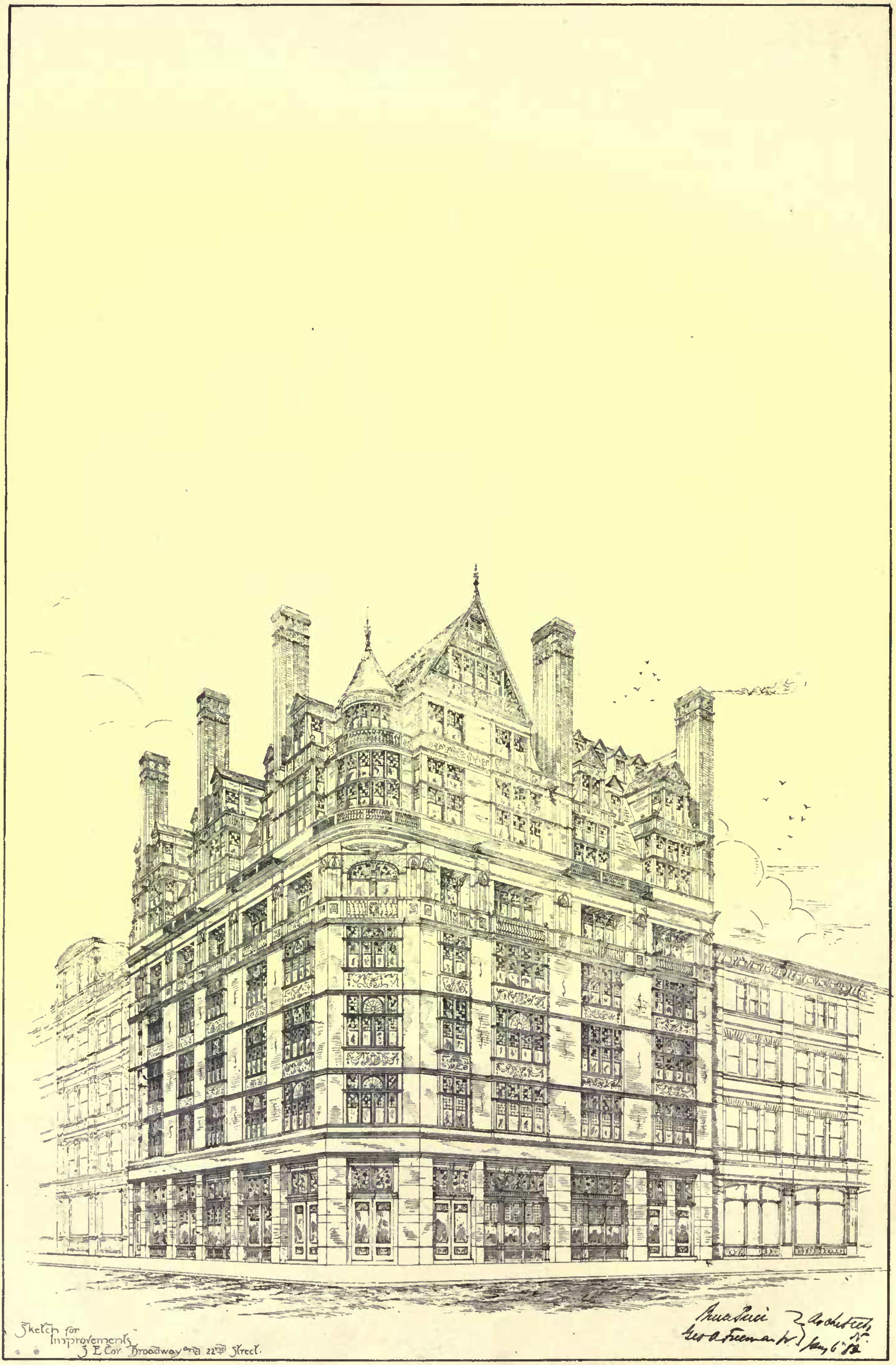
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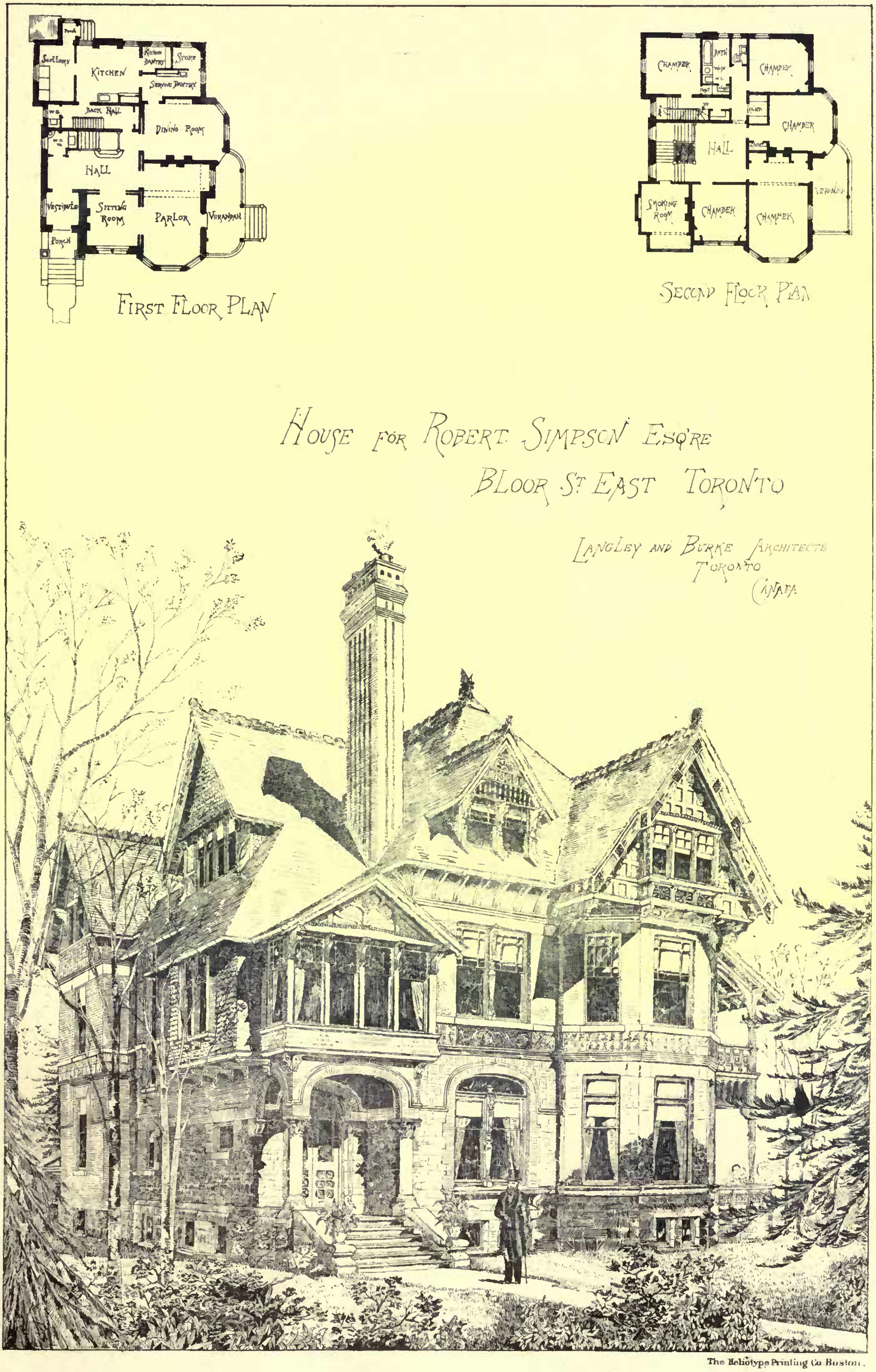
No. 530 American Architect and Building News, Feb. 20 1886.

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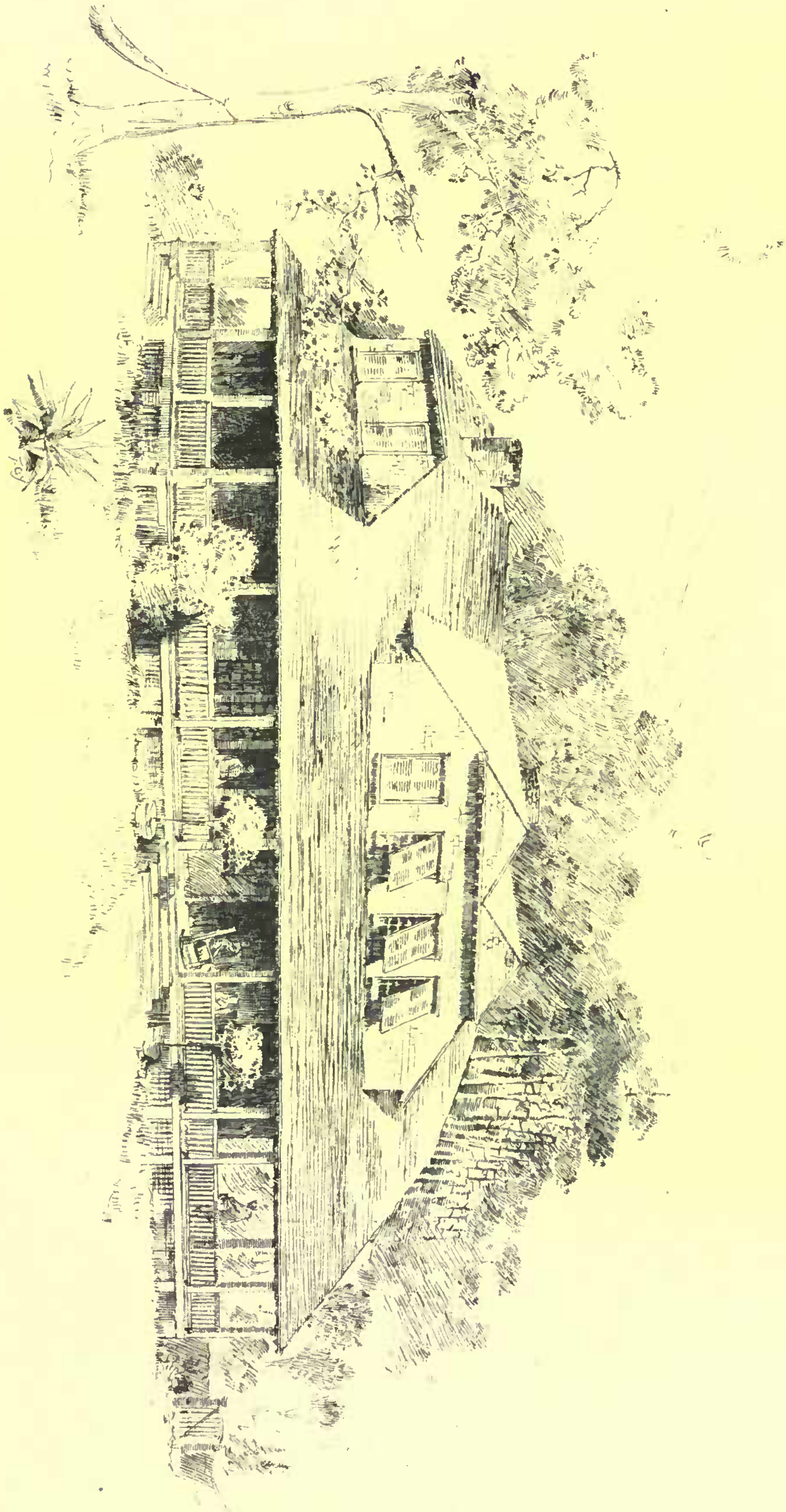
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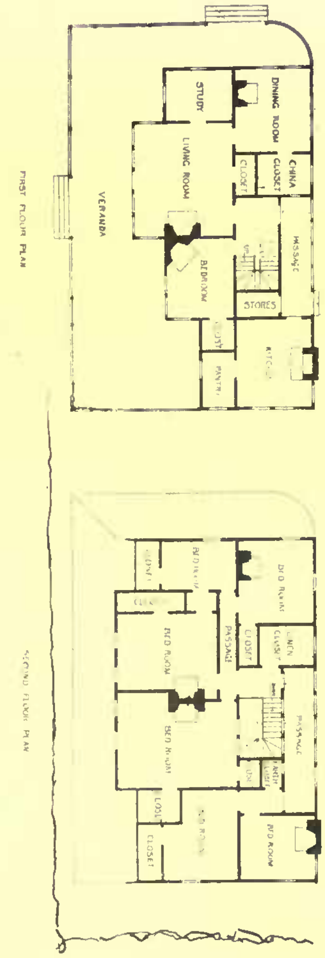
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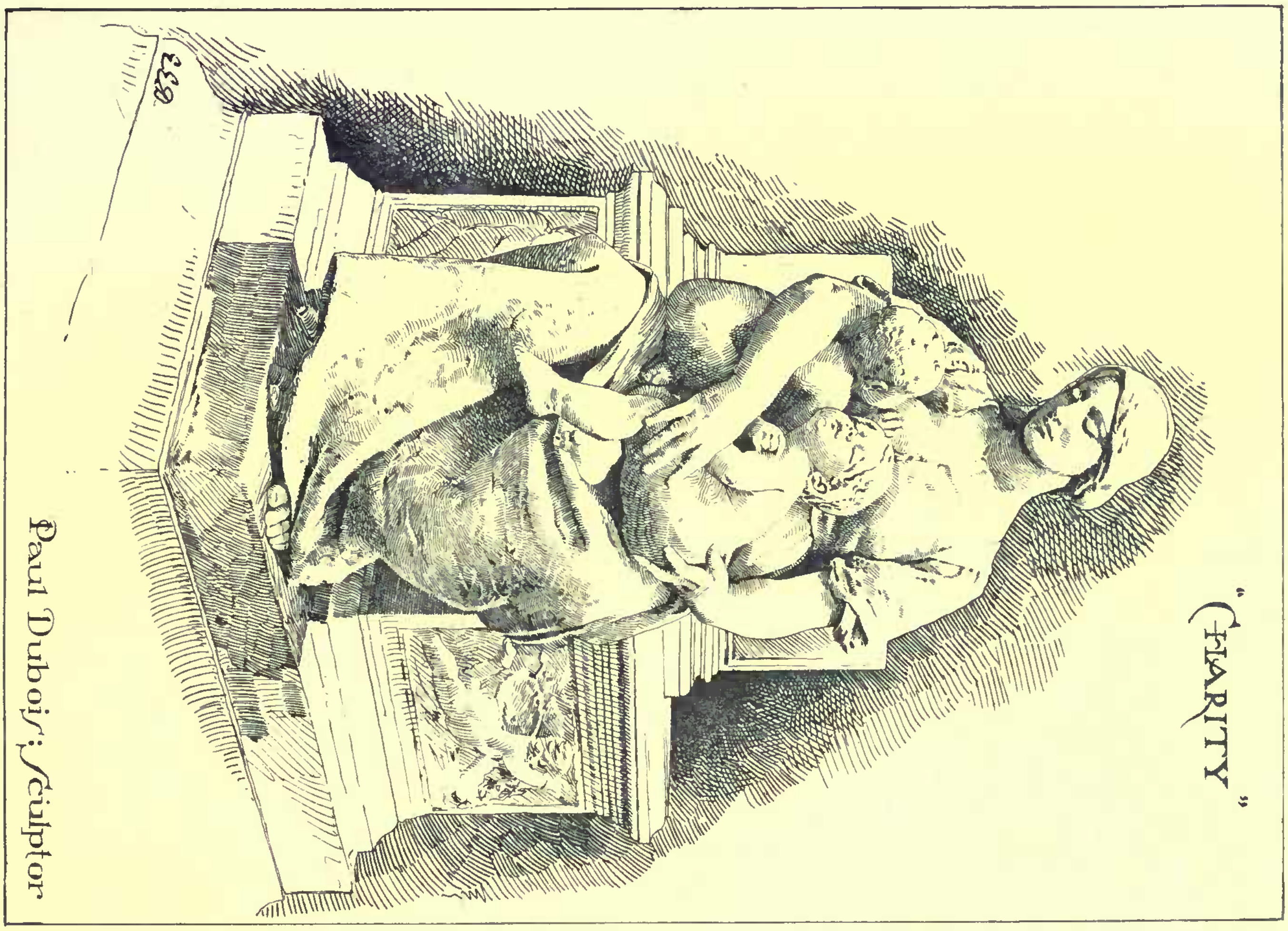




SKETCH for
HOUSE AT INTERLAKEN FLORIDA.
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BOSTON.

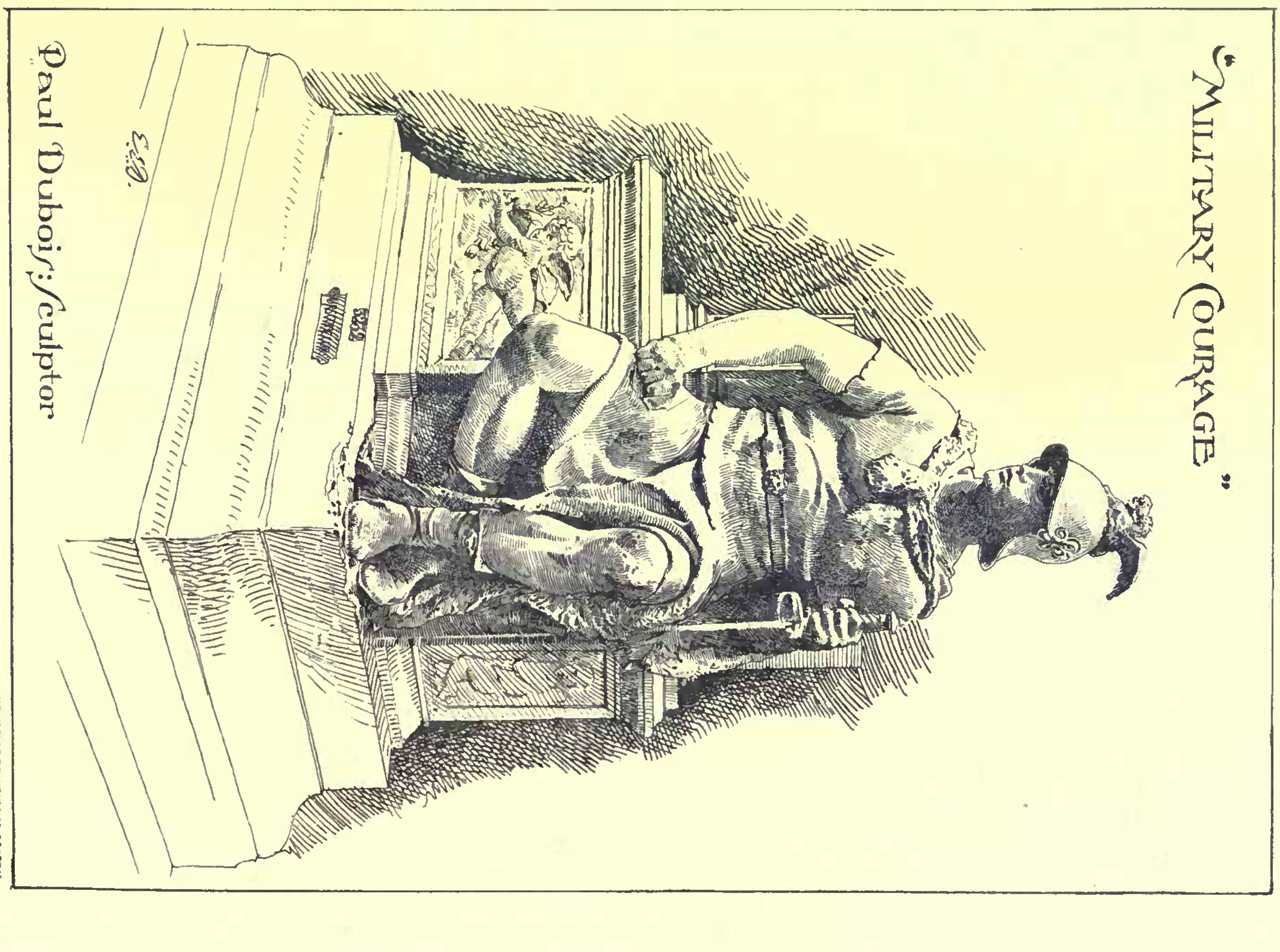
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"CHARITY"

Paul Dubois; Sculptor



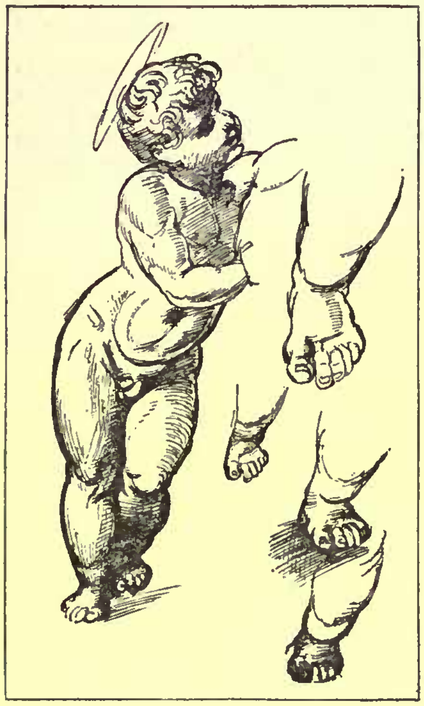
"MILITARY COURAGE"

Paul Dubois; Sculptor

HELIOTYPE PRINTING CO. BOSTON

MURAL PAINTING.[1] — V.

MODERN ENCAUSTIC.



After Raphael.

IN order to maintain the continuity of these somewhat extended and interrupted remarks on encaustic painting, as well as to refresh the memory of the reader without necessitating a reference to a preceding paper, it will be well summarily to restate the formulas for ancient encaustic.

1. Hot painting with colored sticks of wax and resin, liquified by heat, and applied with a brush; then blended and modelled with heated *cestra.*

2. Derivative processes.

(*a.*) Hot painting, as above, with colored sticks of wax and resin, but softened by the addition of an oil.

(*b.*) Cold painting with the colored sticks of wax and resin, softened by oil, and applied as crayons of pastel; then modelled with cold *cestra.*

(*c.*) Cold painting with colored sticks of wax and resin, dissolved in an essential and volatile oil, then applied and finished with the brush.

Strictly speaking, the last two processes are not encaustic, seeing that there is no "burning in." Modern wax-painting is but a variation of the last process. The media may differ, but they all have a wax basis. Here is a medium that I have used with good mechanical results:

Eight sheets of apothecary's white wax — about one-half ounce each,
One-half pound Venice turpentine,
One quart spirits of turpentine.

The wax and Venice turpentine to be melted together, then the spirits of turpentine to be stirred in gradually, and the whole made to boil. If the medium be too stiff, add spirits of turpentine. It can be kept for an indefinite time without injury. Its inventor is Mr. F. D. Millet. It will be seen on comparison that it is composed of substantially the same ingredients as were used by the ancients, viz. — a resinous matter (the Venice turpentine), wax, and an essential oil (the spirits of turpentine). Resin is merely what is left after distilling off the volatile oil from turpentine, and gives the necessary hardness to the medium on drying. The unctuous nature of Venice turpentine — an oleo-resinous substance — facilitates the working of the colors. This medium works perfectly well with the ordinary oil colors, or linseed oil may be added to it; but experience and investigation have led me to avoid oil on all possible occasions. It is the darkening and destroying agent in paintings, and should be reduced to a minimum, especially in decorative works. "Mellowing" does them no good, though often favorable to easel pictures. Oil, moreover, is apt to compromise the dead surface guaranteed by the pure wax medium. It is customary to adulterate wax with spermaceti in order to increase the whiteness. Pure wax should be asked for.

PREPARATION OF THE WALL–SURFACE OR GROUND.

The wall itself was fully discussed in the preceding paper. If it be of a porous nature — such as stone, plaster, unprimed wood, raw canvas, or the like — saturate it with the medium, *i.e.*, till it ceases to absorb, and leave it for a few days to dry. The encaustic process is not a necessity, nor have I ever used it; but were the picture to be painted directly on a stone ground, I should strongly recommend the "burning-in" of the medium. First, heat the wall to a temperature of 100°, as previously described, then lay on the wax medium, repeating the operation if necessary. The cold stone might not absorb the medium without heat. Another method would be to heat the medium till it flows freely, then quickly to apply it. Or, again, the heat might be applied after the coat or coats of the medium, in the Vitruvian method. Some artists prefer a white ground to work on. In this case, lay on a coat of white lead, or zinc, ground in the medium, after the wall has been well saturated with it and allowed to dry. When the picture is to be painted on a ground of oil paint, I should advise the addition of a small amount of linseed oil to the medium, for the first painting — not subsequently — to prevent possible scaling.

THE CARTOON.

This should be carefully prepared in the studio. Extemporizing is a dangerous policy, except within definite outlines. If the figures are large, the painter loses all sense of proportion on the staging. Hence the need of a cartoon drawn to scale. It is not essential that the cartoon should be more than outlined. Any detail of light and shade would be effaced by "pouncing," and even if a tracing should be made from the cartoon for pouncing purposes, it would be difficult — at times impossible — so to place the cartoon that a simultaneous view might be had of it and the wall to be painted. The artist will doubtless need, on the staging, a small study of his picture and detail-drawings; but, above all, he should approach the wall thoroughly conversant with his work, and with a definite purpose. The wall is no place for vacillation or experiments.

POUNCING.

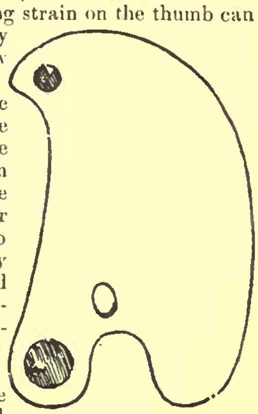
This process is almost too well known to describe. Prick the outlines of the cartoon with a large pin — the nearer the pin-holes the better. Then, on some soft linen, or muslin, pour powdered charcoal, and tie it up like a bag. The medicated charcoal sold by druggists is very fine, and well adapted for the purpose.[2] Having attached the cartoon to the wall, rub the bag freely over it. On removing the cartoon the pricked outline should be clearly visible on the wall.[3]

MATERIALS.

It is not my object to lay down a method of painting. It is taken for granted that any one who would hazard a mural picture is already familiar with oils and water-colors, or at least distemper. Methods are, in a great measure, personal, and no words can adequately describe them. Wax-painting is not unlike oil-painting, or distemper. At the outset it will undoubtedly prove troublesome to one unaccustomed to it. Practice alone can overcome its apparent inconveniences — apparent because short lived, and eventually real conveniences. The rapid drying of the colors, for instance, is harrassing at first, but in reality very advantageous, as it permits the completion of the work in hand at a sitting, or the renewal of it the day following, without the slightest danger of subsequent cracking.

(*a.*) *Brushes.* These must be chosen as in oils, to suit the handling of the painter, and the size of the picture. They should be thoroughly cleaned in turpentine at the end of the day's work, and *afterwards* washed with soap and water. Soap does not remove the wax color from the brushes, nor from the hands. During the work it is frequently necessary to rinse the brushes in "turps" (I like the familiar word), to prevent clogging.

(*b.*) *Palette.* Any large palette will do; but I can recommend one so weighted that the great and numbing strain on the thumb can be avoided when the palette is heavily charged with color and the necessarily large palette-cups. The two dark circles represent leaden discs, which so balance the palette that its whole weight falls on the arm, and is scarcely perceptible. These discs are placed so that they do not come in contact with the colors. They might be fastened to the underside of the palette, or another metal might be substituted. Two palettes are a convenience, and a studio-boy a necessity. Every now and then he should free the palette from the sticky and rapidly-drying colors. Cleanliness is next to godliness, and foul mixtures are not to be tolerated in mural painting.



(*c.*) *Palette-cups.* They should be large enough to accommodate the broad brushes, and provided with a screw top. Two are necessary — one for the medium, the other for spirits of turpentine.

(*d.*) *The Colors.* These should be ground in the medium by an artist's colorman. House-painters do not grind their colors fine enough. Some may be kept in tin cans or glass jars, while others should be tubed. When used in large quantities the cans, or jars, are more convenient. Personal experience suggested the making of cans with screw-covers — these answer their purpose admirably. Glass preserve-jars, with screw-tops, are not bad, but they are liable to be broken in transportation. The same colors may be used in wax as in oil painting.[1] With almost every medium, preference

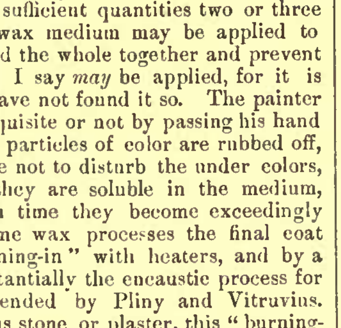
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[1] Continued from page 77, No. 529.

[2] Any fine ground color may be substituted for charcoal.

[3] Under certain conditions the stereopticon, or magic-lantern, may profitably be used for the transfer of the sketch to the wall. I am indebted to Mr. J. W. Black, of Boston, the well-known photographer, who transferred William Hunt's sketches to the capitol walls at Albany, for the following information. The study or sketch for the picture to be painted is first photographed on a glass slide suited to the stereopticon, and then, by means of the calcium-light, its image is projected on the wall magnified to the desired scale. The calcium-light is a necessity, and naturally demands a supply of gas. The stereopticon should be about twice the greatest dimension of the picture distant from it, and at right angles to a straight line drawn perpendicularly from its centre to the instrument. This is the ideal position. It can be used at a greater distance, but not much nearer. The scale of the picture can be increased or diminished by advancing or withdrawing the instrument. Studies of separate figures, if superior to those in the sketch, may afterwards be substituted, or other desirable changes made. The outline cast by the stereopticon is not a sharp one, so that its use by a person unfamiliar with the drawing would be precluded. Mr. Black thinks the instrument could be perfected so as to cast a sharp outline. As the stereopticon must directly face the painting, a special staging must often be constructed. It cannot be used for vaulted or domical surfaces; nor for ceilings unless modified so as to work perpendicularly. Its expense is not great — about $3 per hour. It does away with the large cartoons — though not in fresco painting. For some reasons the enlarged cartoon is preferable, especially if executed by the artist himself. The drawing would probably gain in grandeur and accuracy. But to avoid tiresome repetitions of the same "*motif*," the artist usually delegates the enlargement of his sketch to assistants. The handling of a cartoon on a staging is somewhat awkward. Perhaps the greatest advantage offered by the use of the stereopticon is the possibility of experimenting in scale.

should be given to the earth colors. They are durable and innocuous. If the colors become too dry, add more medium; if too hard, from the congelation of the wax, heat them. The more medium used, the better for the durability of the picture; but an excess of medium robs the color of its body. When it is desired to apply the colors in a semi-liquid state, dilute them in the medium and spirits of turpentine (turpentine must not be used with the whites), but better still, heat and apply them rapidly. Zinc white is to be preferred to white lead. It has not so much body, but is whiter and less injurious to the health. When more covering power is desired, use white lead for the first painting, and zinc subsequently. The most serious objections to white lead are to be found in its combination with oil, which yellows it. Sulphuretted-hydrogen gas blackens it. It would be irrelevant to discuss these questions now, because the medium is wax, not oil. They will be treated later, under oil-painting. Such, however, is the resisting powei of wax to acids and certain gases, that white lead ground in oil and mixed with the wax medium remains unchanged under a stream of sulphuretted-hydrogen gas, when the same pigment without the wax turns to a deep umber, almost as dark as printer's ink. In mural-painting — especially when the medium is wax, it is well to prepare the frequently-recurring tones beforehand, and not mix them on the palette when needed, as in easel work. In the first place, the work will thereby be more homogeneous, and secondly, a great deal of time will be saved. Much color-mixing, while the work is in progress, impedes the flow of ideas. Foul mixtures are avoided if the supply is equal to the demand; when it is not, thinness or slovenliness is the result. Finally, the painter is independent of the uncertain light that prevails so frequently during mural work. Particularly for flesh, he will find it very convenient to mix and tube in sufficient quantities two or three dominant tones. A final coat of wax medium may be applied to the completed painting, so as to bind the whole together and prevent the detachment of loose particles. I say *may* be applied, for it is not always necessary,— at least I have not found it so. The painter can quickly decide whether it be requisite or not by passing his hand over the surface of the picture. If particles of color are rubbed off, apply the medium, taking great care not to disturb the under colors, which a stiff brush will do, as they are soluble in the medium, unless they are very hard. With time they become exceedingly hard, thanks to the resin. In some wax processes the final coat of medium is followed by a "burning-in" with heaters, and by a subsequent polishing. This is substantially the encaustic process for walls (previously quoted) recommended by Pliny and Vitruvius. On certain grounds, such as porous stone or plaster, this "burning-in" might be advantageous, even without the polishing. But on canvas, gold, oil-paint, or any non-absorbent substance, it would be obviously useless. Cauterization causes the colors to shine slightly, even without the polishing. Though a slight shine may, at times, be desirable, inasmuch as the colors are thereby deepened, yet in nine cases out of ten the mural painter wishes to avoid gloss — the delicate, airy, and *dead* tints being the great charm of his work. *Per contra*, a polish on easel pictures, executed in wax, might be very desirable. With our modern methods of impasto for large works, the brushing might be compromised by the encaustic process. Were I to use this process at all, I should prefer to use it for the priming-coat of medium, as Gros did, not for the final coat. A final "burning-in" would undoubtedly greatly prolong the existence of out-of-door work, in simple tones — hence the adoption of it by the Greeks for coloring their temples. We all know how Lionardo da Vinci spoiled his famous battle of Anghiari in the Sala del Consiglio, at Florence, by his clumsy attempts to burn it in, wishing to revive the ancient encaustic methods. "It is evident that he used wax with a solvent, and no doubt a gum to harden the mixture, for when he had finished the painting he applied heat by lighting fires upon the floor. Here was the defective part of his plan. . . . That the heat might also reach the upper portions, fuel was heaped on, and the result was that the wax melted in the lower extremity, making the colors run, to the artist's deep mortification." (Wilson's "*Michael Angelo*," page 69.)



(*e*) *Lamps.* A few of these will be found necessary for dark corners. During the short days of late autumn and winter, the painter is often obliged to work continuously by artificial light. There is nothing like the electric-light, of course, which might be introduced for very elaborate and costly work, but the cases where it would be supplied are rare. When gas cannot be used, any kerosene lamp will do, provided its stand be broad and firm. A very serviceable stand was once hastily gotten up for me — one that did its duty well on a somewhat elaborate staging.

a = the place for the lamp.
b = the reflector.
c = the handle.
The whole was made of tin.

DANGERS.

Avoid the use of turpentine with white pigments. It does not bind them sufficiently. If mixed with them freely they will crack in drying, like mud. The cure for such cracks is a heavy coat of the medium, consequently whites need more of it than the other colors. The following advice to the mural painter may seem superfluous, as being dictated by common-sense (a rare commodity), and known to every house-painter; but mural-painters are not house-painters, and have not had their practical training: —

Of all pigments, white lead is the arch poisoner; use it as little as possible. The mural-painter deals more freely with paints than his brother of the studio, and often works in combination with the house-painter; hence he runs greater risks. To avoid paint-poisoning change the working-suits frequently, and do not eat in a room where there is much fresh paint. Milk and lemonade are antidotes to lead-poisoning, alcohol favorable to it. Turpentine vapors are injurious to the lungs, and often cause faintness. Cure — ventilation. Wax paints adhere tenaciously to the hands. Soap and water do not remove them. Turpentine does, but its continued use is injurious. Other solvents, such as benzine or chloroform, carry them off; but for the dirtiest work, at least, it is well to wear gloves, as a deposit of paint under the nails is a source of danger. The body should be well protected against the damp of new buildings, churches or the like, and against the sudden transition from the heat above to the cold below. As mural painting is very fatiguing, the diet and mode of life should be as simple during the progress of the work as those of a training athlete — old Cennini counsels but two meals a day, "using light and good food, and but little wine." Perhaps we need more, but the quotation emphasizes the importance of simple living. As a rule, artists are unaccustomed to stagings. When undertaking mural work, they run a fair chance of breaking their necks, or at least, of an ugly fall; serious maimings have too frequently been paid as the price of carelessness. Theoretically, the mural painter works on a comfortable railed-platform,— even on a movable tower, capable of being raised or lowered at will. Practically, he often finds himself on a shaky plank or two, with both hands full. Why? Because there is no time nor money to rig up the proper staging. He has, moreover, the almost uncontrollable desire, acquired in the studio, to walk away from his work into — space. Everything on the person that might catch on projecting planks, nails, or the like, should be carefully avoided.

ADVANTAGES OF WAX-PAINTING FOR MURAL DECORATION.

They may be summarized as follows: —

(1) Its durability. Wax resists moisture, the action of acids, and sulphuretted-hydrogen gas.[2]

(2) Its dead surface, and exquisite, airy tones. It has low-toned capabilities, too; may be polished, and even [*horresco referens!*] varnished.

(3) Its impasto, equalling that of oils, without the disadvantages of the latter.

(4) Its quick-drying qualities, that enable the painter to complete the work in hand at a sitting, or to continue it without fear of cracks.

OTHER METHODS.

There are other systems of wax-painting, both cold and hot, but the same principle dominates them all. The one that I have described has the immense advantage of extreme simplicity and directness. The so-called "Spirit Fresco Painting," invented and used with success by T. Gambier Parry, also by Sir Frederick Leighton in his mural work at South Kensington, is but another phase of wax-painting, less simple than the above, but — as is claimed — very durable. A full account of this process is contained in a pamphlet prepared by its inventor, at the request of the Committee of Council on Education, and obtainable at the South Kensington Museum. In the author's own words I will give a condensed account of it: —

"The wall must be dry. No painting materials can be durable on a damp foundation. The surface to be painted must also be perfectly dry and porous. The best is good common stucco, precisely the same as that always used for *buon fresco.* The one primary necessity is that it should be left with its natural surface, its porous quality being absolutely essential. All smoothing processes, or 'floating' with plaster-of-Paris, destroys this quality. All cements must be avoided, some of them having too hard and smooth a surface, and consequently being devoid of all key or means of attachment for colors, and others being liable to efflorescence and chemical action."

The medium and preparation of colors are described as follows: —

"Take in any multiple of these proportions, according to the quantity required for a week: —

Elemi resin (gum elemi)	2 oz.	} weight.
Pure white wax	4 oz.	
Oil of spike lavender	8 oz.	} liquid measure.
Finest preparation of artists' copal	20 oz.	

(If a stronger kind of copal is used, 18 ounces are sufficient.) With these materials, incorporated by heat, all colors, in *dry* powder, must be mixed, and the most convenient system is to do so precisely as oil-colors are mixed on a slab, and put into tubes. The colors keep in this way for many years. I have many in tubes above twenty years old, as fresh as when put there."

[1] It will be seen later that certain dangerous oil pigments are perfectly safe when mixed with wax. Hence a more extended palette in the latter medium.

[2] In answer to my inquiry, Professor Lewis K. Norton kindly writes: "There can be no doubt that wax prevents, to a certain extent, and to a very considerable degree, the action of the air-moisture and gases present in the air on pigments. Of course it would not materially hinder strong chemicals from acting upon pigments."

"To prepare the wall-surface, choose a time of dry and warm weather. Dilute the amount of medium required in once-and-a-half its bulk of good turpentine. The mixture is more effective if compounded by heat. With this wash let the surface of the wall be well saturated, the liquid being dashed against it, rather than merely washed over it. After a few days left for evaporation, mix equal quantities of pure white lead (in powder) and of gilders' whitening (common whitening being often full of large grits and too strong of lime) in the medium, *slightly* diluted with about a third of turpentine, and paint the surface thickly, and when sufficiently evaporated to bear a second coat, add it as thickly as a brush can lay it. This, when dry — for which two or three weeks may be required — produces a perfect surface, so white that colors upon it have all the internal light of *buon fresco* and the transparency of pure water-colors, and it is so absorbent that their attachment is complete.

"Paint boldly and simply as in *buon fresco;* as much as possible *alla prima*, and with much body; and use pure oil-of-spike in your dipper freely. Decision is very necessary, because, by much harassing the surface, the materials are liable to be disintegrated, the resins rise to the surface, and perfect deadness is lost. If the surface has been left for so long as to have become quite hard, wash over the part for the morning's work with pure spike-oil, to melt the surface (hence the name Spirit Fresco), and prepare it to incorporate the colors painted *into* it. If any part requires second painting the next day, do *not* wash again with spike-oil; it is liable to bring the resins to the surface, but use plenty of spike-oil in your dipper, as a water-color painter uses water. Paint rather solidly than transparently. Transparent glazing is less likely to dry dead than colors used with white lead."

"*The Rationale of the Painting* is, therefore, this: that the colors in powder, being incorporated with material identical with that which has already sunk deep into the pores of the wall-surface, and has hardened there by the evaporation of the spirit-vehicle, may be regarded as belonging to the mass of the wall itself, and not as mere superficial applications. This result is produced by the spike-oil being the one common solvent of all the materials, which turpentine is not; the moment the painter's brush touches the surface (already softened, *if necessary*, for the day's work), it opens to receive the colors, and, on the rapid evaporation of the spike-oil, it closes them in, and thus the work is done."[1]

One of the encaustic methods, suggested by Count Caylus (1692–1765), is so simple — though designed for easel-pictures — that I cannot but quote it. With modifications it might be used for larger works on the wall.

"First. The cloth or wood designed for the picture is waxed over, by rubbing it simply with a piece of beeswax.

"Secondly. The colors are mixed up with pure water, but as these colors will not adhere to the wax, the whole ground must be rubbed over with chalk or whiting, before the color is applied.

"Thirdly. When the picture is dry, it is put near the fire, whereby the wax is melted and absorbs the colors."[2]

FREDERIC CROWNINSHIELD.

[To be continued.]

MEDIÆVAL ROMANCE AND ART.

EVEN if there be many of our subscribers who read the following paper when it appeared a short time ago in the *Architect* we believe that the interest that centers about Arthur's table is of such perennial strength that they will not object to seeing it again.

The question has often been asked, where did Mr. Burges obtain the subjects, such as Aristotle and the lady, which he was fond of having sculptured and painted? A full answer to the question would be a *résumé* of mediæval romance. The following paper, which was read about forty years ago at an archæological congress in Chester by the late Thomas Wright, may suggest the origin of some of the subjects represented by Mediævalists and selected by Mr. Burges.

In the earlier times of the Middle Ages the fine arts were, to a great extent monopolized by the clergy, and applied chiefly to sacred purposes. For some centuries, even in miniatures, few manuscripts were illuminated except Bibles, and Psalters, and Service Books, which are valuable chiefly as illustrations of Christian inconology. Until the thirteenth century that class of illuminated manuscripts still predominated. The period last mentioned — the thirteenth century — witnessed that great development of this intelligence of the Middle Ages, the effects of which spread through all classes of society, and which was particularly visible in the new classes of subjects on which the artist exercised his talents. It was about this time that those sculptured seats came into vogue, by which the carver introduced into the churches those burlesque pictures which illustrated the occupations of every-day life. At the meeting at Worcester last year, I had the honor of calling attention to the interesting specimens preserved in that city and at the Great Malvern and other churches, and there are specimens no less remarkable in Chester Cathedral. In the thirteenth century the illuminators or painters worked no longer for the church alone. They painted walls for princes and nobles, and they illuminated manuscripts on a great variety of subjects for the use of knights and ladies. The subjects which had at this period most interest for the higher ranks of society, and more especially for the ladies, were the various incidents of that extensive class of literature, the Mediæval romances. These we shall trace on a variety of domestic articles of this period appropriated to the use of the female members of the baronial household, carved in ivory or wood, or other material, and they appear more especially on those curious and elegant caskets which are by no means uncommon in great collections of Mediæval antiquities, and of which we have here the opportunity of examining a very remarkable specimen, through the kindness of its possessor, our respected associate, Mr. W. Seth Stevenson, of Norwich. It is distinguished by the beautiful style of its execution, and the character of the workmanship, the costume of the figures, and other circumstances lead us to ascribe it to a date not later than the earlier part of the fourteenth century. The part of it which first and chiefly attracts attention is its pictorial embellishment, and to this I intend to confine my remarks.

The particular description of the pictures before you will be rendered more intelligible and popular by a few general remarks on the class of literature to which they relate. It is perhaps hardly necessary for me to remind you that the word "romance," the meaning of which is now restricted to a work of fiction, referred originally to the language only in which they were written. *Lingua Romana* (the Roman tongue) was the name which, in the Middle Ages, was applied to all the languages which were derived directly from the Latin, such as French, Anglo-Norman, Italian, Provençal, or Spanish. A *romans* (*Romanus liber*) was a book written in any one of those languages; and as during this period they were used chiefly in writing these peculiar compositions which we are still in the habit of calling romances, it became common to quote for authorities in such compositions the *romans*, or book written in the Romane language, until the word, at a much later period than that of which we are more especially treating, began to be taken in its present signification, and in which I shall always use it in the course of the following observations.

The subjects of the Mediæval romances were derived from various distinct sources. Some were taken from the old traditions of the people among whom they were composed, and these form, perhaps, the largest and most important class; they are certainly the earliest in the date of their formation. Two large and very important cycles ran through the Neo-Latin or Romane languages, and were afterwards transferred to German, English, and other tongues. One of these, grouped round the kings of the Carlovingian race, was peculiar to the Franks, and its various romances were generally known under the title of *Chansons de geste*, the meaning of which is best rendered in modern English by the term "historical romances"; the other cycle has for its heroes the supposed British king, Arthur, and his knights. The first of those cycles, which is exceedingly voluminous, having its scene at a period the events of which belonged to a comparatively true history, had far less of the marvellous in its construction, and was almost entirely occupied with the description of warlike expeditions. The story of the expedition into Spain, and the disaster of Roncesvaux, appears to have been the only fragment of it ever popular in England. The cycle of King Arthur, which was from its subject much more English, having a foundation which partook far more of the really mythic character, was devoted almost entirely to scenes of love and gallantry — the chivalry of the chamber and the tournament.

As the influence of these compositions became more general and extensive, the composers began to aim at variety, and then they sought foreign subjects, and scrupled not to borrow them from ancient and even from Scripture history. Thus we have the romance of Alexander, the romance of Troy, the romance of Jason, that of Æneas, and a multitude of similar subjects. Gradually the writers became more inventive, and then we find allegorical and mystical romances, a class of which the grand type was the famous romance of the "Rose," in which the progress of the soft passion was allegorized in a manner the most original and extraordinary.

From the twelfth to the sixteenth century the literature of the ladies was especially and universally one of love and gallantry, and of this the casket under our consideration, as certainly designed for ladies' use, is a very interesting example. History shows us, on one side, how essentially the subjects engraved on it were congenial to the education of the fair sex during the Middle Ages, and, on the other side, how much influence they exerted on its morals and fate. I will endeavor to illustrate this by the description of the subjects themselves, and I shall take them rather in the order indicated by the history of romantic literature than in that in which they appear on the casket.

There were two very remarkable branches of the romantic cycle of King Arthur which enjoyed an extraordinary popularity during the Middle Ages; one related the love adventures of Lancelot and Arthur's frail Queen Guenevra, the other, those of Tristan and the fair Isonde, the queen of King Mark of Cornwall. It was the passion portrayed under its different causes and circumstances, in one case influenced by the personal accomplishments and temperament of the individuals, in the other by a power, the belief in which formed

[1] Here is still another medium, from the *Painter:* "Copal resin may be blended with twice its bulk of turpentine, the two ingredients being kept for some time in a bottle in a warm place, after which pure white wax, melted to a creamy consistence, is added." The principle is always the same.

[2] "*Mural or Monumental Decoration.*" W. Cave Thomas. Winsor & Newton, London.

a portion of the superstitions of the Western people before their conversion to Christianity, and which still weighed heavy upon their faith — that of fate. You probably all know the story of Tristan. He was sent over to Ireland to fetch home Mark's betrothed queen, Isonde, who brought with her an enchanted potion, which she was to drink with her husband, and which had the virtue of creating an everlasting love between the persons who first pledged each other in it. By a fatal error the lady and Tristan drank the potion in their passage from Ireland, and, although she became King Mark's wife, her love had thus been irrevocably disposed of.

There is an incident in the romance of "Lancelot" which appears to have had so peculiar an attraction for the romance-readers of the thirteenth century that one of the celebrated poets of that period, Christian de Troyes, made it the subject of a separate poem, entitled "La Charrette," or "The Cart." A "felon" king, Brandemagus, had had carried away Queen Guenevra as his prisoner, and her lover, Lancelot, who arrived at court too late to defend her, set out in her pursuit. An accident deprived him of the use of his horse, and in his distress he asked for information of a deformed dwarf who was leading a cart, and who assured him that he knew which way the queen had gone, and engaged, if he would ride in his cart, to carry him to his mistress. It appears that at this time none but condemned criminals ever rode in carts, or, at least, those who had become subjected to some horrible disgrace, and it was only his extreme eagerness to overtake the queen, which induced Lancelot reluctantly to accept the dwarf's offer. On his road he was met by Gawayn, who was highly scandalized at his friend's position; but they continued their route together until they came to the castle of a lady, who came out with her damsels to receive Gawayn with honors, while Lancelot was hissed and pelted by the menials. Through the intercession of Gawayn, who explained his friend's situation, the lady was, with great difficulty induced to extend her hospitality to Lancelot, who, after all, was treated with the utmost disrespect. Next morning, Lancelot having been furnished with a horse and spear, he set out with Gawayn, and finding two roads which lead to the Castle of Gaileon, in Brandemagus's kingdom of Goirc, where they knew that monarch was conveying his captive, they separated in order that each should take a different path. After meeting with several disagreeable adventures, most of them arising from his untoward journey in the cart, Lancelot at length came to a wide river which he was obliged to pass by means of a bridge formed of an immense and sharp-edged sword. Having reached the other side in safety, he perceived a "villain" approaching who lead two lions with which he was compelled to fight, but finding that his strokes produced no effect he drew forth the ring which had been given him by the Lady of the Lake, and then his opponents disappeared, and he learnt that it was all enchantment. After this he reached the object of his search, but the adventure of the cart, which was known also to Guenevra, produced a quarrel and temporary separation between the queen and her lover.

The incidents of this story could easily be recognized in the four compartments of the back of the casket, numbered from nine to twelve. Number eleven is evidently intended to represent Lancelot in the cart; perhaps the lion's head was introduced by mistake of the carver, who ought to have introduced here the dwarf. Number twelve perhaps represents the lady of the castle and her damsels, looking on Lancelot and his cart with feelings of shame. In number ten he is passing the strange and perilous bridge, and number nine represents his encounter with the lions. Some attributes in these figures are not easily explained in the romance, and they may, perhaps, have been taken from some other version of it. Perhaps the spears and sword-blades issuing from the clouds are intended to indicate that it is all the work of enchantment.

We thus see that the romance of "Lancelot" (which, I may observe, was the foundation of the later romance of the "Mort d'Arthur") has its representative on our casket. We shall find the other grand love-romance — that of "Tristan" — figuring here, too.

In the course of their adventures, the two lovers had given each other a rendezvous by night under a tree in King Mark's orchard. The king, informed of their intentions by a spy, had concealed himself in the tree to be a witness to his wife's infidelity. The night happened to be moonlight, and as the queen approached the spot she beheld the shadow of her husband's face in a fountain under the tree, before she had said anything to criminate herself. She made her lover understand their danger, and their conversation took such a turn as convinced the king that Isonde and Tristan had been unjustly slandered.

This scene is represented in the compartment of one side of the casket, and there are circumstances about it which would seem to show that the carver was following a model, the subject of which he did not perfectly understand. There is something original in the substantial manner in which the shadow of the king's face is represented; but, if we look closer, we shall see that, while the real substantial King Mark in the tree is represented as a beardless youth, his shadow in the water possesses a beard of fair dimensions. The carver has either taken the beard in the substance above for part of the tree, or he has transformed a part of the water beneath into a beard for the shadow.

I am inclined to think that our casket presents another subject taken from the romance of "Tristan." On one occasion Isonde was obliged to clear herself by an oath, taken upon the holy relics, to visit which she had to pass a river. Tristan came there in the disguise of a beggar, and was employed to carry his mistress over the water, and a pretended accident enabled her to avoid perjury, by an equivocation which I shall beg to be excused explaining. The compartment appears to represent Isonde carried on the shoulders of the pretended beggar. I will only remark that this seems to be the way in which gentlemen carried ladies in the Middle Ages.

The other two classes of romance to which I have alluded also find their representative in this casket. The romance of Alexander the Great, with its various branches, enjoyed great popularity during the thirteenth and fourteenth centuries; and some of its incidents gave rise to separate poems or tracts. Several of these relate to the great monarch's instructor, Aristotle. One division of the romance, and no small one, related to the monstrous animals the conqueror of India was said to have met with in his travels, and a tract, in which Aristotle is made to describe these monsters, had an extensive influence on the science of natural history as it was taught in the Middle Ages. But the philosopher and his pupil were made to figure in a story of a more amusing character.

Love and gallantry appear to have been the grand occupation of the ladies in all grades of society during the Middle Ages, and the laxity of Mediæval manners allowed of a degree of license which we can now with difficulty conceive. If this procured for the fair, on the one hand, the devotion and service of the gentler class of poets, it exposed them, on the other, to the attacks of the satirist and moralists, and these were often bitter and coarse. But the vicious found their revenge in a number of stories in which the wisest philosophers and sages were humbled beneath the irresistible sway of beauty. One of these stories related to Alexander and his teacher, and was in the thirteenth century made the subject of a little poem by a trouvère named Henry d'Audeli, which bears the title of the "Lai d'Aristote."

Alexander, according to this romantic story, had a very beautiful Indian princess for his mistress; and her charms were so powerful that the king neglected not only the lessons of his teachers, but the counsels of his ministers. At last Aristotle took an opportunity of expostulating so warmly with his royal pupil, that for a time Alexander absented himself from the society of the princess. The latter, at length, pressed her lover to tell her the cause of his apparent coldness, and he made a full confession. The lady was fully resolved to have her revenge. She clad herself one morning in a loose dress, gave herself her most tempting airs, and placed herself in the way of the philosopher, who, in spite of his age and wisdom, was suddenly seized with the most violent passion, and pressed earnestly for her love. The princess refused to listen to him unless he first consented to place himself on his hands and knees, submit to a saddle and bridle, and in that position allow her to ride round the garden on his back. He agreed to her terms, and, in the midst of her ride, Alexander, who had been made privy to the plot, suddenly showed himself from a window, and rebuked his wise instructor for his folly. The moral of the story taught that none were exempt from love's power, not even those who were so eager to speak of it with disrespect.

The compartments on the front of the casket contain allusions to the romance of Alexander and to the lay of Aristotle. In the first, Aristotle is employed in teaching his pupil. The next represents the subject of the lay. The allusion in another compartment is more doubtful. It has been suggested to me that it represents a scene in the romance of Alexander, in which that monarch, in the course of his Indian campaign, was made to descend to the bottom of the sea in a glass globe, in order to survey the wonders of the deep. Perhaps it is Alexander's globe which is here descending among the sea-nymphs. But I am inclined to think it may be a mere ordinary representation of nymphs bathing in a fountain.

The allegorical romances have their representative in the subject on one end of the casket, and perhaps also in the larger subject which covers the lid. The first is probably taken from the romance of the "Rose," and seems to represent Danger consenting to receive the lover into the tower in which Belaccueil is shut up. It would take, I am sure, more time than you would be willing now to allow me to give such an analysis of this romance as would explain the story.

The large figure on the lid represents the attack upon the defence of the castle of Love. The weapons, it will be seen, are roses, with one exception, that of Love himself, who makes use of his arrows. The tournament in the middle is a part of the subject, which was one of great popularity in the age to which this relic belongs, and is frequently found represented on articles used by the ladies. It appears, indeed, that among the imaginative Provençals of the warm south, where their love-allegories were wrought into substantial pastimes, this scene of mock warfare was not unfrequently put into actual practice. Such a scene is recorded as having been acted at Vincenzo in 1216; a wooden castle was built, defended by ladies dressed in magnificent robes, and attacked by knights. Flowers were the only missels they were permitted to use. A Provençal poet of the same age, Rambaud de Vaqueiras, has described, in one of his lyrics, the ladies as carrying on this counterfeit war, and building imitations of castles: —

> Truan mala guerra
> Sai volon comensar
> Donas d'esta terra,
> E vilas contrafar;
> En plan o en serra
> Volon ciutat levar
> Ab tors.

i.e., "The ladies of this land will commence here vile, wicked war,

and counterfeit the villains; they will raise a citadel with bowers, on level ground or on a hill."

There remains one other subject on our casket to explain, which, if it does not belong to what we are in the custom of calling romances, is still of a romantic character. It is taken from what may be called the romance of science. The compartment represents the well-known story of the fabulous unicorn — the fiercest of animals — which yet became tame when in the presence of a pure maiden, and it was only under these circumstances that it was ever killed by hunters. This subject, involving a beautiful allegory, was a favorite one, and is found in innumerable paintings and sculptures. It is rightly placed here among subjects which relate almost entirely to love.

Thus, in tracing the various subjects represented on this beautiful casket, we are throwing new light on the manners and sentiments of a remote period, but one which can never fail to have an interest for the historian. The knowledge of manners and sentiment is a very important portion of history itself; while by this same monument we are gaining a new insight into the history of literature, one which shows us the influence which that literature had on the character of the age. It becomes thus a speaking picture of the past. You will no doubt remember that singular illustration of the influence of one of the very romances pictured on this casket, furnished by the immortal stanzas of Dante, where the poet describes his meeting with the shades of the two lovers, Francesca and Paolo da Rimini. The lady, at the request of the poetic trespasser on the regions below, gives the following account of her temptation: — "There is no greater grief," she is made to say, "than to remember in one's misfortune the past period of happiness. . . . But if thou hast so great a desire to know what was the first root of our love, I will imitate him who weeps and speaks at the same time. We were reading one day for pastime the adventures of Lancelot, and how he was caught with love; we were alone, and without any distrust. Many times this reading made our eyes meet, and our cheeks change color; but it was one single passage which overcame us. When we saw the soft smile of his mistress smothered by the kiss of the lover, this one here, who will never be separated from me, kissed me on the mouth, all trembling; the book and its writer were for us another Gallehant. That day we read no more."

But there is another point of view in which the consideration of this casket has an interest for the archæologist. We find these identical subjects, collectively or separately, figured on other caskets, and in a manner so similar that they were evidently copied from one model. In the first place there exists another casket, of which a rather rude engraving was given in Carter's "*Ancient Sculpture*," and which is now preserved in the museum of the late Sir Samuel Meyrick, which contains the same subjects, arranged in the same order, and so similar in design that we might have supposed it the same casket, but for a variation in one subject. I have some reason for suspecting that another casket in the same collection contains some of the same subjects. A similar casket, apparently then existing in some collection in Italy, and engraved by Gori in his *Thesaurus Diptychorum*, contained the subjects taken from the romance of Lancelot, with the variation that the three ladies are introduced in the same compartment with Lancelot in the cart, and that he is engaged, as in the romance, with two lions; and it has the siege of the castle of love, as here on the lid; but the other subjects are different, one side being taken up with subjects from the romance of "*Valentine and Orson*." The siege of the castle of love is found, perhaps, more frequently than any of the others. In the sixteenth volume of the "*Archæologia*" a plate of ivory was engraved with a carving of this subject treated in nearly the same manner, but showing the moment in which the knights made themselves masters of the fortress, and are received with open arms by its defenders; and a similar plate of ivory, with the same subject, engraved in Du Sommerard's Album, shows that this article was the back of a mirror. The same subject appears in one of the illuminations of the now celebrated *Louttrel Psalter*. The lay of Aristotle and the legend of the Unicorn are of still more frequent occurrence.

The circumstance of this repetition of the same subjects and the same designs is a curious phenomenon in the history of Mediæval art. It shows that there was one common origin for certain classes of artistical productions — a principal school, from which, probably, not only the practice of the art, but the particular series of subjects to be engraved were derived, and these were varied, perhaps, according to established rules, on which a careful comparison of such relics as that now before us may throw some light. The same practice is traced in other lines of Mediæval art, and offers a question well worthy of minute examination.

I will conclude with pointing out a singular circumstance connected with this particular subject. A few of these romance subjects are found sculptured on buildings, and even in churches. The legend of the Unicorn is met with on architectural monuments, and the lay of Aristotle is sculptured on the masonry of the cathedral of Lyons, and on the stalls of that of Rouen. In the church of St. Pierre, at Caen, there is a capital of a column, of the beginning of the fourteenth century, about the date of our casket, on which the sculptor has represented part of this same series of subjects, and under the same forms. There we have Lancelot in the cart, the passage of the bridge of the sword, and the combat of the lions, joined with the legend of the Unicorn, the lay of Aristotle, and a somewhat similar romance connected with the name of Virgil. It would seem as if the stone sculptor had obtained, among his other designs belonging to his own class of artists, a copy of this particular set of the artist from whose hands we derive the ivory caskets.

NOTES AND CLIPPINGS

QUARRYING A LARGE SLAB OF GRANITE. — A single slab of granite 354 feet long, 3 to 4 feet thick and 11 feet wide, was recently separated from the main ledge in the Flynt quarry, Monson, Mass. A row of wedges were set, several hundred in number, and the workmen, beginning at one end gently and carefully tapped the wedges, moved by degrees down the line, until the other end of them was reached, when the same operation was repeated. The slab had to be cut up for transportation. — *Exchange.*

THE EADS JETTIES.— The Chicago *Tribune*, as a reminder, reprints the following facts concerning the contracts for building the Mississippi jetties: The first contract with Captain Eads contained provisions that payments were to be made upon the guaranteed production and maintenance of channels as follows: —
For a channel 20 x 200, $500,000; for a channel 22 x 200, $500,000; for a channel 24 x 250, $500,000; one year's maintenance, $250,000; for a channel 26 x 300, $500,000; one year's maintenance, $250,000; for a channel 28 x 350, $500,000; one year's maintenance, $250,000; for a channel 30 x 350, $500,000; one year's maintenance, $500,000; annual payments for maintenance, $100,000 per year for twenty years, $2,000,000; payment at end of ten years, $500,000; payment at end of twenty years, $500,000; total cost for work and maintenance twenty years after completion, $7,250,000.

The salient feature of this contract is that no money was to be paid until certain guaranteed results were produced. After the first three payments and that for one year's maintenance had been paid, and $250,000 more, it became evident that the jetties could not produce a channel 26 feet deep by 300 feet wide, whereupon Congress set aside the original contract and substituted for it another with the following provisions:

A cash payment of	$750,000
For a channel 25 x 200	500,000
For a channel 26 x 200	500,000
For a channel thirty feet deep, without regard to width (a channel one foot wide would comply with the contract)	500,000
Annual payment for maintenance, $100,000 a year for twenty years	2,000,000
Payment at end of ten years	500,000
Payment at end of twenty years	500,000
Total	$5.250,000
Amount paid before change of contract	2,000,000
Grand total	$7,250,000

The foregoing figures are taken from the official documents and can be verified. Particular attention is called to the fact that in this contract the Government has made a precedent for an expenditure of $100,000 a year for the keeping open of a channel at the mouth of a great river.

UNEARTHING OF A GREAT RED GRANITE STATUE NEAR ALEXANDRIA.— A correspondent kindly sends us the following interesting extract from a private letter which has just reached him from Ramleh, near Alexandria, containing a short account of the unearthing of an ancient statue: "A great red granite statue has been discovered ten miles away in the desert. It represents the famous Pharaoh, who was responsible for all the Egyptian plagues, and on one side of it a statue of a little baby, said to be that of the next Pharaoh, who perished in his rash attempt to drive through the Red Sea. The Chief of the Coastguardsmen — Middlemas Bey — discovered it when hunting for smuggled tobacco, so he invited Mr. Carver, myself, and some others to go and see the old fellow raised to the light of day once more. It has been lying there 3,000 years. About eighteen of us met at the little station a short mile off in the Desert, and after an hour's crawl in the train, were landed forlornly in the midst of the sand, nearly two miles from our destination. We walked to the place and found the statue surrounded by about forty Arabs, and just about to be raised. As it seemed likely to be a long business, we wandered about and explored a small staircase leading down into a diminutive chamber. We had a well-known Egyptian with us, a Mr. Willbor, to explain all the hieroglyphics, etc., and we discovered bits of mosaic pavements by scraping away the sand. All the wiseacres present were convinced it is the site of an ancient city, and that many interesting discoveries will be made when Middlemas Bey can set his men to work digging. About twelve o'clock rumors went about that the old King was coming up out of his grave, and we all flocked back to welcome him to daylight again after a subterrestrial existence of 3,000 years. Of course, one of the ubiquitous tribe of photographers was present, and before the resurrection apparatus was taken away he took us all hanging on to the ropes like stage sailors, the statue in the middle standing up in its grave. There are no end of hieroglyphics written on his back and up the sides. He is very well carved, and almost perfect, except for the nose, which has succumbed to the wear and tear of existence. The muscles on the arms are well shaped, and he is well shaped altogether, and considered by Mr. Willbor to be a very valuable 'find.' At half-past twelve we had lunch in the fort which is close by. There are a great many good English cannon rusting away because no one has energy enough to remove or preserve them, and we found large quantities of shells, loaded and unloaded, in the ammunition vaults. The final destination of old Pharaoh is yet undecided. No doubt by the next mail I shall be able to tell you more about him." — *London Standard.*

The Toronto Court-house Competition. — The author of one of the seven "reserved designs" for the Court-house at Toronto asks to be put in communication with the six other members of this select band, so that they may take concerted action, looking to securing the proper professional treatment at the hands of the authorities.

The Ventilation of the Mont Cenis Tunnel. — The dangers of deficient ventilation have repeatedly been shown in the Mont Cenis tunnel. The ordinary freight-train, leaving Modane at 9 p. m. the 21st of December, was observed to come to a standstill at about two miles from the mouth of the tunnel, and not start again. The conductor of the freight-train coming from the opposite direction was informed of the fact, and, when coming up to the standing train, he found the train-men of the latter in a dead stupor. They were taken off and transported with all possible speed to Bardonechia, where all of them soon revived. A similar accident happened in the same tunnel only seven weeks before, and both are ascribed to the bad air in the tunnel, which cannot ventilate itself as can the St. Gothard tunnel. Luckily no such accidents have befallen passenger-trains, the reason for which may be sought in their more rapid motion.—*Exchange.*

The Hunt Pictures at Albany. — The statement is making the rounds of the press that Superintendent of State Buildings, Andrews, has recently been in consultation with an artist from Boston, a former pupil of the late William Hunt, who painted the allegorical pictures in the Assembly Chamber [in the Capitol], regarding the restoration of the damaged pictures. Mr. Andrews denies that he has had a consultation with any one for that purpose. He says, however, that a pupil of Mr. Hunt's, who assisted to paint the pictures, some time since looked over the damaged works and offered to restore them for $10,000, but that no intimation was made that the subject would even be considered. The same statement is coupled with one that the pictures were ruined by leakage from the roof. Superintendent Perry was questioned relative to the truth of the report. He said, "When I took hold of the work the walls were damp from leakage, and my first move was to have the roofs calked tight and put an end to the dampness. The young man who assisted Mr. Hunt in painting the pictures had some talk with me about restoring them, but I threw out no inducement to him to convey the impression that such a course would be pursued." As comment on the foregoing, which appears in the Albany *Journal*, we will say that we do not know how high in the rank of artists this "former pupil" now stands; but we are told that, up to the time Hunt began to paint at Albany, the pupil's duties had consisted of grinding colors and putting priming-coats on the artist's canvases. And we have heard an intimate friend of Hunt's, and one thoroughly familiar with the capitol and the paintings, exclaim that, so far from daring to ask $10,000 for his "restoration," the former pupil "ought to crawl on his knees and beg for the privilege of trying to preserve them."

Proposed Destruction of Dankwarderode Castle, Brunswick. — It seems that the town of Brunswick, not satisfied with the ousting of the ducal family who have reigned there for over seven hundred years, are seriously contemplating the destruction of their ancient castle — one of the six or seven buildings in Germany in which may still be seen the general arrangements and some of the architectural details of the residence and fortress of one of the practically independent nobles of the twelfth century. The projected Vandalism is of especial interest to Englishmen, from the fact that Queen Victoria is a member of the Guelph family, whose ancestral home it is proposed to demolish to make way for a new street. The original foundation of the castle dates back to the dark ages before the twelfth century, and is attributed to Dankward, a descendant of Wittekind, after whom it was called Dankwarderode. In the twelfth century it passed, by right of his wife, to the Emperor Lothair, and through his daughter Gertrude, who married the Duke of Bavaria and Saxony, to the Guelph family. It was Gertrude's son, Henry the Lion, who, about the year 1166, erected what, notwithstanding all additions and alterations, may be regarded as the existing building, and placed the world-famed Brunswick lion upon his pedestal in the courtyard, facing the flight of steps which led to the great hall of the castle. For the next hundred years Dankwarderode was the centre of all that was great and splendid in the land, second only to the Burg of the Emperor himself, the scene of constant hospitality and of frequent festivities; but its history, subsequently to the death of Albert the Great, in 1279, is a sad one. Belonging by arrangement to all the scattered branches of the family alike, jealousy prevented its being long inhabited by any; it was unrepaired, for that which was every one's business was no one's, and so ruinous had the castle become by the sixteenth century, that a fire which took place at that period seems to have hardly made matters much worse. It, however, aroused Duke Julius, in 1569, to undertake a scheme for the restoration, at least, of the great hall, a scheme which, through the jealousy of the other branches of the family, and the opposition of the town, was only very partially carried out in his lifetime, and was subsequently abandoned. This was fortunate as far as the historical interest of the structure is concerned, for the preservation of the Romanesque remains did not enter into the scheme. In 1700, and again in 1763, restorations of a more or less history-destroying character were carried out. Then came the period of the Westphalian rule in Brunswick, during which the castle was fitted up as a barrack; in 1867 it was given up to Prussia as a building used for military purposes; and in 1873 became, on the same grounds, the property of the German Empire. Another fire in this year destroyed the southern part of the building, and the rest, including the great hall, was sold to the town in 1878, to be pulled down to make way for new streets. The scheme has been vigorously opposed by the artistic and archæological world in Germany, and especially in the neighboring learned little town of Wolfenbüttel, and has not yet been carried out; but, as has happened more than once or twice in similar circumstances in England, the united opinion of all who are capable of forming one is in danger of being contemptuously set aside by those in authority in Brunswick. — *Builder.*

TRADE SURVEYS

One of the characteristics of the present industrial activity is the low and declining cost of raw material. In all former periods raw material was high in price, and advanced while the activity continued. Another influence deserving of notice is the abundance and cheapness of money as compared to former periods of activity, when money was relatively scarce and dear. A third point of difference between former eras and the present is to be found in the direction which capital and enterprise are taking, and it is in this particular tendency that a great deal of special interest is to be found to money-lenders, architects and builders. The short-lived prosperity of former years was due largely to the fact that the stimulus to activity arose from the necessities of the few, comparatively speaking, the wealthy few, as compared with the great masses of the people. The characteristic of the present era of activity is due very largely to the fact that its sources arise in and out of the necessities and the requirements of the great mass of people, the millions. Its foundations are therefore stronger, deeper and broader. It is only within a few years that any thought whatever has been given to the providing of homes for the people. The old baronial idea, of a castle with its meagrely-housed defendants, has been realized in this factory age. The next ten or twenty years will witness an abrupt and general departure from these old notions and conditions. The creation of so much wealth is stimulating every wage earner with the desire of having and owning his own little palace with all its appointments. This departure has been made possible and necessary by railroad construction, which has multiplied the opportunities ten to one hundred fold for the hitherto dependent masses to become directly or indirectly their own employers. One cause of and reason for the slow departure from old into new conditions, has been due to the arbitrary system of determining the value of labor performed. Under this arbitrary system wages have ruled nearer the lower limit than nearer the higher limit. This obedience was necessary prior to the era of railway construction because of the absence of opportunities for bettering individual conditions. The conditions which made conformity a necessity in the economic system, which determined wages arbitrarily rather than by the value of the services performed are disappearing gradually and the wage earners are finding themselves little by little surrounded by opportunities and advantages, which enable them to have more say in the fixing of compensation. To most employers this growing power is a source of apprehension and annoyance. They have become accustomed to the exercise of an almost absolute authority which the law of supply and demand has guaranteed to them, and they think it is flying in the face of fate and of all known laws and experience for the wage-earners of the country to endeavor to establish any other rule or anticipate any other conditions. A transformation is in progress, from this condition of dependence, so to speak, to one of apparent independence. When that transformation is effected, the earning power of the masses will be considerably increased. As it increases their necessities will correspondingly increase and in this way a wide avenue will be opened up for the employment of capital, energy, skill and labor, wider than was ever yet opened up in the history of human progress. We are now before this opening avenue. This is no word-picture, no attempt to depict fine thoughts, but it is stating in plain words what is apparent to all close observers and thinkers. We have about dispensed with the leadership of the soldier except as a military policeman, and we are putting the architect in his place.

The building conditions can be disposed of in a dozen words. The architects are busy, and the builders are actively preparing for their best year. This is the testimony from every large city. The approach of fine weather will give an impetus to building.

The people are anxious to build and buy. The manufacturers of the country are waiting for orders, willing to sell goods upon low margins. Producers everywhere are anxious to render services for living profits. The spirit of speculation does not exist. The whole country desires to come down to legitimate business methods. This is evidenced by the general movement in the direction of trade and manufacturing combinations by which only enough material will be made to meet market demands. A higher standard of trade morality is being erected. The cut-throat policy is left to the few. The great manufacturing interests are insisting upon a recognition of higher and better standards. The railroad managers are nearing the realization of their efforts, and much progress has been made already in the removal of causes of chronic warfare.

Much of this year's building will consist of church building, theatres and opera-houses, apartment-houses, warehouses, packing-houses, schools, colleges and buildings of a more or less public character. In Missouri, Kansas, Arkansas and Texas a large amount of money will be expended in these directions, large compared to investments of former years. Iron-makers and makers of various kinds of machinery give information of much interest concerning work they have in hand in their special line for these States. The mills of the Ohio valley in the St. Louis region and in the South are well filled with orders at this time for all kinds of iron and steel work for delivery in the States west of the Mississippi. A great deal of electric-light work is projected, and considerable already contracted for. The activity in the West is referred to as an indication of a general movement among mechanics and persons of small means to take advantage of more inviting opportunities in these new States. Besides, considerable railroad building is in progress there, and a great deal of railway construction will be completed this season. Parties engaged in important industrial enterprises in the South favor us with statements concerning the influx of an industrial population, from some of the older States such as Pennsylvania, Ohio, and to some extent, two or three of the New England States. Textile mills are projected for erection this summer in Georgia, blast-furnaces and mills in Alabama, as well as coal-mining operations upon a large scale. The coal-producers around Birmingham have effected a combination which they hope will result in a virtual monopoly of coal-mining and coal-shipping in that region. New York architects are engaged on factory projects for those two States. Coming nearer home, the architects of New York and of the New England States report a general stirring up among the building interests. An unusually large number of small houses will be erected, and there are no modifications to be made of statements as to the activity in mill-construction. While the mill-owners of New England do not feel the short-hour movement to be the wisest, and while they do not believe the advance in cost of material, and the higher wages will work to their advantage, yet they feel and say that the industrial conditions are healthy, that abundant orders are coming in, that they feel assured of steady employment and that, in the long run, they expect to come out as well as when wages and raw material were lower. It is well to keep these general industrial conditions in view. All of our industries are but parts of one dependent whole, and weakness in one is reflected in others.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 531.

FEBRUARY 27, 1886.

Entered at the Post-Office at Boston as second-class matter.

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THE citizens of Elmira, N. Y., had occasion to take the law into their own hands the other day, after the American manner, the constituted authorities, also after the American manner, having shown themselves perfectly inefficient in securing the abatement of a gross public nuisance. It seems that the State Reformatory at Elmira recently constructed a drain to connect with the city sewers, building it of cement-pipe, under the supervision of the city authorities. After the drain was built, the directors of the Reformatory began to use it for getting rid of gasoline refuse and other nauseous and dangerous volatile substances. Whatever may be the merits of cement-pipe, it is not impervious to gases, and the wells, together with the cellars and basements of the houses near the sewer, soon began to be flavored with hydro-carbon. Application was promptly made to the city authorities, and to the directors of the Reformatory, to have the gasoline discharged through an impervious channel, if at all, but no notice was taken of the remonstrances. After waiting patiently for a long time, the city Board of Health, a body endowed with considerable animation as well as intelligence, met to discuss the matter, and passed a resolution declaring the sewer, as used, to be a public nuisance, dangerous to health, and directing the Health Officer to abate it forthwith by cutting off the Reformatory sewer from the city system. There seems to have been some question as to whether the Health Officer, unassisted, would have been able to carry out the edict of the Board, and a small army of volunteers from among the citizens assembled to help him. The Board of Health lent the aid of its approving presence, and in a few hours, by the combined efforts of the multitude, the Reformatory sewer was cut off, at its entrance into the city limits, and closed.

SOME time ago a meeting of the Royal Institute of British Architects was devoted to a discussion of the various sorts of roofing, introduced by the reading of a paper on the subject by Mr. Ralph Nevill, and the experience of the members with different kinds of roofing material, as brought out in the course of the discussion, has a good deal of interest for us. Among other things, one member observed that roofs of plain tiles, such as are common in England, have very little power of resistance to earthquakes, the disturbance of last year having, as he said, brought down in a heap nearly every tiled roof in the affected district. These tiles were probably hung to the laths by a little ear, or "lug," at the top, without nailing, and the vibration of the buildings was sufficient to shake the ears from their hold. That tile roofs will not keep out snow was observed by one member, and apparently agreed to by the others. Mr. Nevill remarked that in the great snow storm of 1882 hardly a single tile roof proved impervious. As every one knows, tiles are usually laid with a comparatively small lap, and their surfaces being generally somewhat uneven, crevices are left, through which fine snow easily drifts. The common way of preventing this is either to bed the tiles in mortar, or to plaster them underneath with mortar, introduced between the laths, but this is considered to be in some ways objectionable. In Germany, according to a member, tiles are made longer than the English ones, and are laid like slates, with each tile lapping over the second tile below, so that there is everywhere on the roof a thickness of at least two tiles, and often more. This must make a very heavy roof, but one much more secure against snow than the English kind.

IN regard to flashings for tile roofs, there seems to have been a general agreement that lead was unsatisfactory. One gentleman considered that the best way to protect the junction of a tile roof and a wall or chimney was to cut a groove in the masonry, wide enough to admit the tiles. This allowed space for filling up tight with cement if settlement of the roof should make it necessary, and proved much more effectual than metal flashings, which he regarded as "an abomination" on tile roofs. Other members thought that "fillets," or projecting masses of cement, stuck to the masonry, and following the line of the roof over the tiles, were more satisfactory than flashings. We have some doubts whether this would be the case in our destructive climate, and remembering Viollet-le-Duc's abhorrence of such fillets, we should advise American architects who have occasion to use tiles either to follow Mr. McVicar Anderson's method of cutting grooves for them in the masonry against which they may come, or to adopt what Viollet-le-Duc says was the ancient plan, and build a little projection, following the rake of the roof, to lay them on, with another overhanging it, and bevelled, so as to throw the water running down the wall or chimney well out over the channel formed by the two parallel projections. An improvement in the form of the tiles themselves was suggested by a member, who called attention to the fact that nearly all ancient tiles had the lower edge bevelled, so that a violent wind would tend to press them against the roof, instead of lifting them away from it. In regard to slate roofing, the Secretary of the Institute mentioned that in all French buildings of any importance slates were now secured by hooks instead of nails. He believed that this modified way of laying was introduced by Viollet-le-Duc, about twenty-five years ago, but it had been universally adopted, and roofs so laid were found far less liable to damage from wind than when nails were used. Whether the American slate nails, with inverted cups of tin under the heads, to act as springs upon the slate, have been used abroad, does not appear from the report of the discussion, but they must, we should think, combine many of the advantages both of nails and hooks.

THE question of the advantages of cremation forms the subject of some papers in *La Semaine des Constructeurs*, by M. Mariette. As in England, the cemeteries used by the people of the great French cities are now full to overflowing, and it has become necessary to choose between cremation in some form and the transportation of the dead to a resting place beyond the city limits. In Paris, besides the probability of the continued growth of the city, which has already enclosed the burial-grounds of Perè-Lachaise, Montmartre and Montparnasse, there is an additional reason for the removal of the future cemeteries to a considerable distance away from the town in the military necessity which forbids any interference whatever with the freedom of movement of soldiers about the *glacis*, or zone commanded by the guns of the fortifications. Modern military science has increased the range of cannon, and with it the width of the glacis, to such an extent that a cemetery outside of Paris would have to be reached from the city by railroad, and the French have a great aversion to this method of transporting the bodies of the dead. Every one who has been in Paris has probably been pleased with the respect shown by all persons for the feelings of mourners, the people, even in the busiest streets, generally stopping, on meeting a funeral procession, and standing with uncovered heads until it has passed by; and the affectionate sensibility characteristic of the nation is shocked at the matter-of-fact rudeness which is almost inseparable from the transportation of a funeral party by rail. Judging from the account which M. Mariette gives of the circumstances surrounding the conveyance of corpses from London to the immense necropolis established by the London and Southwestern Railway at Woking, his compatriots are not far wrong in their aversion to such ceremonies. Woking is about twenty-one miles from London, and a special funeral train runs to the cemetery every day. The station in the city is, according to

M. Mariette, both doleful and dirty. On the ground floor are two rooms, absolutely bare, in which the corpses wait for the trains. Above are eight other apartments, decorated with designs for tombstones, in which the mourners are sorted into appropriate classes, according to the price they pay for their tickets, while two elevators, under the management of the railway porters, convey the coffins, numbered to prevent mistakes, to a travelling columbarium, or baggage-car divided into pigeon holes, numbered to insure that the corpses shall be correctly divided among their owners on arrival. At the cemetery are two stations, the first of which is appropriated to dissenters, who, with their corpses, are unloaded as expeditiously as may be, and the train then proceeds to the terminus, where the mourners have an opportunity of regaling themselves at a cheap restaurant while their spiritual comforter is putting on his vestments in a tiny dressing-room attached to the station. After these preparations are completed, the first-class corpses are put on hand-carts, and drawn first into the little chapel where the last services are held, and then to the grave; while second and third-class persons are simply piled into a large wagon, which distributes them hurriedly among their final resting-places. All this is perfectly British, but it does not suit the taste either of Frenchmen or of sensitive English people, and it is not surprising that many of both nations, not merely among the scientific sanitarians but those of artistic temperament, who remember the Roman catacombs, look forward to cremation as a means of shielding the remains of their beloved dead from rudeness and neglect, as well as of preventing them from becoming a source of danger to the living.

THE recent assassination of the Prefect of the Department of Eure in France, in the seclusion of a compartment of a railway-carriage, has called out vigorous attacks upon the ridiculous system of building such conveyances, by which each compartment is shut off by itself, and is inaccessible from any other under any circumstances, unless the stoppage of the train at a station should permit a passenger to get out of the door of his compartment, and walk along the station platform to the door of the compartment which he wished to enter. Most of our readers probably recollect the origin of this curious system of planning. After George Stephenson had got his first experimental locomotive in condition for making a trial trip, he was naturally desirous of inviting some guests to ride after it as witnesses of his success; but nothing was at hand sufficiently comfortable for distinguished persons to ride in, and he was ingenious enough to extemporize a passenger-car by getting three stage-coaches, and fastening them together by means of a joist running beneath the bodies. The trip, as every one knows, was highly successful, and, the august guests being pleased with their accommodations, it seemed to the English mind that these could not possibly be improved, and the type of three stage-coaches tied to a pole was immediately adopted as the official and inviolable pattern for all railway cars. Some trifling mishaps, such for instance, as the burning of a few passengers alive in the compartments from which they could neither escape nor give intelligence of their condition, together with the murders and assaults which frequently take place in them without any risk to the assailant, have, indeed, excited attention among the public, but not among the railway managers, who not only retain the ancient pattern of cars unchanged, but in many cases still "fresco" the exterior with a clever imitation of the decorations upon a stage-coach of the last century.

ON the Continent, where the habit of connecting effects and causes is more prevalent than in England, some sort of way of communication between the different portions of a train has for many years been provided. On the lines owned by the French Government, cars are in use which have doors opening between the compartments, and the emigrant cars on the great railways are without compartments; while Swiss cars, almost without exception, are arranged like ours, with a clear passage from end to end of the train, and seats on each side. We think that the Swiss cars almost always strike the unaccustomed English or French tourist as being remarkably pleasant and convenient, and if the designs of their own cars were made in conformity with the preferences of those who ride in them, the English and French patterns would probably soon be changed, to the great advantage of the railway companies as well as of their customers. Corporations, however, move slowly, and a succession of vigorous prods, such as those which the newspapers are now administering, will probably be needed before the railway companies will abandon their present routine of dragging empty first-class imitation stage-coaches about over their lines, and saddling the expense of this amusement upon the passengers who are wise enough to prefer the greater safety of the second and third-class cars. In regard to comfort, there is no comparison between a light, airy American car, in which every one rides with his face toward his destination unless he chooses to turn his seat over, and the stuffy foreign cells, in which only one passenger in four can look out of the window in comfort, and half the passengers, if the train is full, must incur danger of sea-sickness by riding backwards; while the risk of contact between first and second-class passengers, which excites such horror among English people who usually ride second-class themselves when they are at home, can as easily be avoided, if necessary, by the same means as is the intrusion of unauthorized passengers into the drawing-room cars on our lines.

ON the twentieth day of January the railway which crosses the River Mersey far below the bottom of the channel, was opened to the public by the Prince of Wales. According to the account in the *British Architect* the project of uniting Liverpool and Birkenhead by means of a tunnel has been agitated and discussed for twenty years, and the plan which has finally been carried out is the result of long and anxious study. As it now exists, the Mersey tunnel is by far the longest submarine passage in the world, the portion beneath the river being twelve hundred and fifty yards long, or more than two-thirds of a mile, while the whole tunnel is about four and one-half miles long. The boring through the red sandstone rock which underlies the river was accomplished by a Beaumont machine, cutting a cylindrical hole seven feet in diameter, and advancing through the rock at a rate varying from twelve to twenty-four feet a day. With the help of two of these machines the work has been accomplished in less than three years, at a cost of about two-and-one-quarter million dollars a mile for the whole road, or about ten millions for the line complete. The road begins beneath the Central station in Liverpool, twenty-eight feet below the street level, and extends to the London and North-western Railway Station in Birkenhead, which it reaches at a point thirty feet below the ground level. Between the terminal stations are two intermediate ones, at James Street in Liverpool and Hamilton Street in Birkenhead. At each station are three enormous elevators, carrying eighty persons at a trip, to raise to the surface the passengers who are too feeble or too lazy to walk up the various staircases and inclined planes which also lead to the ground level. The whole scheme is so nearly similar to that of the Hudson River tunnel line that it will be interesting to engineers and capitalists to know whether the travel through the tunnel pays interest on the cost. The ferries between Liverpool and Birkenhead now carry, on an average, twenty-six million passengers a year; and as the railway, by taking and delivering passengers at two points in the business district of each city, will save passengers the time, expense and trouble of getting to and from the river-front on each side, it is likely that it will be generally preferred to the ferries; while it will accommodate also a considerable traffic of through passengers and freight, coming from the south, which is now sent to Liverpool by a very circuitous route. The income from these sources of business will, it is supposed, pay a sufficient return on the investment; and the expectation seems reasonable. In New York very nearly the same conditions exist, but they are, it would seem, more favorable to the success of a tunnel railway than at Liverpool. Not only is the local traffic across the Hudson River probably much greater than that across the Mersey, but three or four immense railway systems, converging at Jersey City, stand waiting, so to speak, for a means of direct communication with New York, from which they are now cut off.

WE came very near to being compelled to ask our readers to suggest a name for our new edition, as, so far as much thought could discover, the language did not afford an appropriate title. We have at length been reconciled to the word "Imperial," in spite of its anti-republican sound, because the word, like "royal-quarto," has a significance to bibliopoles, while to the profession it is hallowed by long acquaintance with Whatman's "imperial" drawing-paper. We hope that the Imperial Edition will realize our own and our reader's expectations.

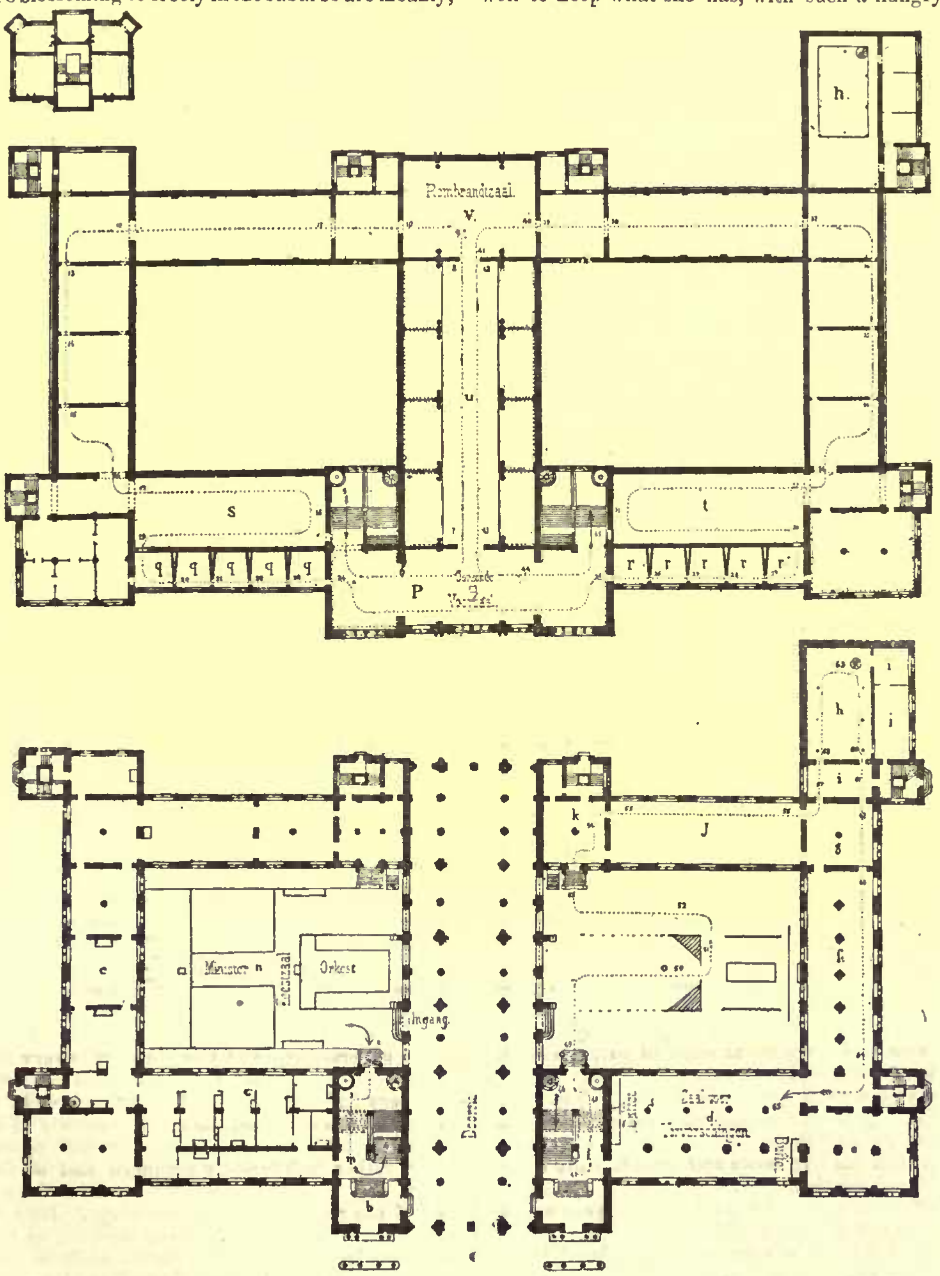
NOTES OF TRAVEL.

AMSTERDAM.



AMSTERDAM is following in the footsteps of nearly every city of old Europe. It is trying to be modern; though fortunately for those who love the old quaintness architecturally associated with the name of the Dutch capital, the movement is feeble enough just at present, and is confined almost exclusively to the quarters beyond the Amstel, quite away from the city proper. There is no such building boom as Rome, for instance, is passing through; but returning to Amsterdam after an absence of even only a year, one can see the tendency of the people in the line of architecture. All around the eastern edge of the city a great tract is being rapidly covered with dreary, monotonous brick houses, in planning which the builders have not even taken the trouble to help themselves to any of the quaint motives so abundant and close at hand. It seems so easy to build simply, especially when one can feel no scruples about copying outright from his neighbors in another quarter of the city. And yet the difficulty of building houses which shall be at once simple and good is shown nowhere more effectually than here, where the whole centre of the city is full of interesting brickwork, while nearly all of the modern houses which are blossoming so freely in the suburbs are meanly, or, rather, not at all designed, and are as barren and cheerless as some of the boarding-house districts about Bloomsbury Square, London. And this applies quite as truly to the more pretentious houses which the wealthy have erected. Some of the interiors are interesting and artistic, grace to the spoils from the Dutch country seats; but, generally speaking, architecture in the Netherlands has never been as uninteresting as it is to-day. However, so long as the newness keeps beyond the river, and is content to leave undisturbed the real Amsterdam, one can quite forget that the Dutch have modernizing aspirations. The quiet canals, and the quaint old gabled houses, blinking their great plate-glass eyes at each other, will last for many generations yet, to the delight of every artist, for the people love their old homes, even if they are rather indefinite in the quality of their suburban aggregations. Once inside the city, Amsterdam is still the quaint, old Dutch town that Rembrandt and Van Steen, and merry Pieter de Hooch lived in and painted from; and if its architecture is not just what we would most wish to see reproduced in the Back Bay or on Murray Hill, it has quite substantial merits of its own, and its homely, honest look is a pleasant relief after the stucco-classic German art. When the modern feeling shall have invaded the Kalverstrat and reached as far as the Dam, the painter and architect can cross the name of the city off his list of calling acquaintances and know it no more, for its old-time simplicity and quaintness are Amsterdam's chief architectural merits.

As has been the case with most of the Northern nations, the architectural unit of Holland, so to speak, has been the private dwellings, whence the Dutch have succeeded but very indifferently with buildings of a monumental character. Indeed, aside from the *Nieuwe Kerk* and the palace, the latter of which, with its gloomy, forbidding aspect, might almost pass for a State's prison, Amsterdam has no monuments worthy of more than a very passing notice. Considering this fact, those who have to any extent kept trace of the movements of architecture in Europe during the past decade must have felt considerable interest in the scheme which was to provide the city with a building worthy to receive the treasuses of art with which the various public galleries are so richly endowed. It is an interesting problem, and it would seem as though the architect who would undertake such a task could not lack for suggestions and ideas even from the very canvasses for which he would be building. Very few of the greater European art-collections are properly housed, it must be remembered, and nowhere before has there been such an opportunity to provide definite accommodation for a definite number of masterpieces. Indeed, with the exception of Berlin and Munich, all of the Continental collections are either installed in old structures which were never intended for art-galleries, or have grown way beyond their accommodations, so that many of the paintings cannot be judged in place. But at Amsterdam there was *carte blanche.* The paintings are not likely to increase in number; indeed, Holland will be doing well to keep what she has, with such a hungry neighbor as Prussia watching her from across the border. There was plenty of room for the building — as good a site as could be asked for in so flat a city; the amount of money at the disposal of the architect seems to have been unlimited, judging from the results; and altogether it was one of those ideal problems which come hardly more than once in a generation — an opportunity to show that architecture is truly the Mother art, and worthy still to hold its own with the works of those good old days when to be an artist implied painter, architect, sculptor, musician, and poet, as well as dry man of calculations and strains. The very thought of it suggests delightful bits of quaintness, such as the Fleshers' Hall at Haarlem; a dignified stateliness like the old patrician homes of the Heerengracht; and the sturdy, self-reliant air which the common houses as well as the common people of Holland have borne ever since de Ruyter swept the seas; and, could such a problem be successfully realized, it would be well worth the journey to Amsterdam to see an embodyment in masonry of the ideas akin to those which inspired the golden era of Dutch art.



The New Art Museum, Amsterdam.

The New Museum was formally opened to the public last summer. It is located in the new quarter which has sprung up in the southern portion of Amsterdam, almost on the extreme edge of the city. A great deal of ground has been devoted to the building, and it furthermore fronts upon a wide boulevard, if such a term can be applied to

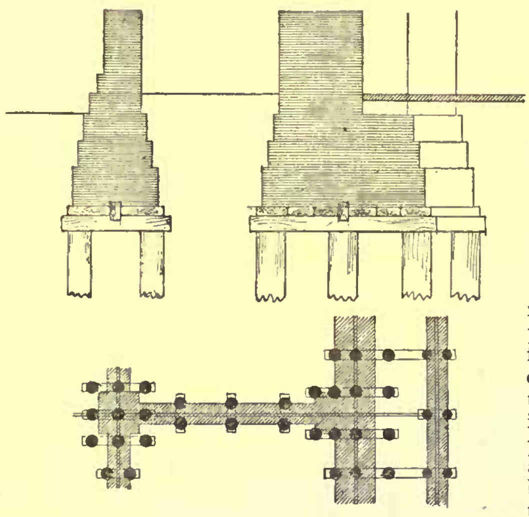
a partially-filled canal. The first appearance of the building is quite pleasing, with its boldly-marked entrance in the centre, the long lines of roofs, and the well-proportioned corner towers. But it does not grow upon one in the most satisfactory manner. The bold entrance proves to be really not an entrance at all, but a wide, double driveway through the building for the benefit of the future occupants of the lonely marsh which stretches out indefinitely from the rear of the Museum. It is not altogether like the Dutch to be so spontaneously accommodating towards the coming generation, and one is rather tempted to believe that the drive-way was only a little invention of the architect, who found his second story larger than his first, and had to fill out in plan somehow. And the design is in the Gothic style — not fourteenth century French Gothic, nothing as decided as that, but a nondescript, which might be called Gothic for lack of a more definite name; a style which Karl Baedeker, with his usual architectural inexactness, might designate as very early Dutch Renaissance, though the only suggestions of anything akin in feeling to the national architecture are in a few of the details, which distantly recall some of the old work at Groningen. But imagine Netherlandish art in a Gothic frame! The building is of brick, with a granite basement and light stone trimmings. The mouldings and the details generally are good and unobtrusive, evincing careful study throughout, but the roof is unnecessarily broken up by small dormers, which can hardly be useful, and are certainly not ornamental, and the finials and turrets which are scattered over the towers are aggressive and tiresome. Still, considered in mass, the general proportions of the façade are well balanced and pleasing, and, aside from the choice of style, perhaps the worst thing that can be said of the design is, that it lacks definite character as an Art Museum. It is evidently a public building, but it might be almost anything, from an insurance office to a royal mint, though on one side are some mural paintings referring to the arts, rather too high placed to affect the general design, and close inspection reveals inscribed on the upper frieze the names of celebrated artists; but neither of these devices succeed in giving the design the *cachet* one ought reasonably to expect of such a building.

The interior is quite another thing. As will be seen by the plan given herewith, the building encloses two large courts. On the ground floor a portion of the right wing only is utilized, the court being filled with a quantity of architectural fragments and admirably-selected casts for the use of the art-school, while the long room on the outer side is occupied by the etchings — a collection which has not an equal anywhere. The paintings are all in the upper story, which is reached by two stairways leading to the large vestibule P, of plan. Why there should be a vestibule there is by no means apparent. It is large enough for a royal audience-room, and is furnished and decorated most lavishly; but as there is no lack of either space or comfortable settees anywhere in the museum, this immense anteroom would strike one as being a rather lavish waste of space. Opening from this is the wide corridor *u*, one of the pleasantest features of the whole plan, on either side of which are alcoves, small by comparison with the vestibule, but large enough to receive each a complete set of paintings from one school. This portion of the arrangement leaves nothing to be desired. The light is perfect; the entrances of the alcoves are draped with rich hangings, just such as the old masters loved to introduce in their interior scenes; the paintings are nicely hung — not too crowded; the walls are upholstered in soft greens or reds, and the floor of the alcoves being raised slightly above that of the passage, and covered with a soft carpet, one can study the rich old canvasses quietly and satisfactorily, and feel quite alone. The art and the surroundings are thoroughly congenial — a condition which rarely exists in public art-galleries.

But the room beyond is a disappointment in every respect. It was intended to be the focus of interest — the *Salon Carré* of the Museum — and appears to have been designed only for one painting — Rembrandt's matchless "Night Watch," which is hung on the outer wall, directly opposite the line of the corridor *u*, where it can close the vista, and be seen from any desired distance. Those who saw this painting in the old Museum of the *Trippenhuis*, will remember how badly it was placed, being in a small room with a low side-light, which gave unpleasant reflections from nearly every point of view; nevertheless, the painting always seemed large and overpowering — much larger than it really was, in fact, appearing to grow as one looked at it, until the whole room was filled by it. But here in the New Museum this magnificent work of art, one of the most interesting paintings the world has ever produced, is lost — belittled in the immensity of a room ten times too big for it. Possibly the idea was to give it grandeur by isolating it, but the result has been quite the contrary; and the meek little man in the foreground of the painting, with his trig boots and broad, white collar, seems meeker and more subdued than ever, while the sturdy captain beside him seems to glare more savagely than he did a year ago, as though he would walk right out of such a solitary canvas and get him to some quiet corner, where he can be seen and appreciated by his friends. Of course, nothing can ever kill such a noble painting. It is grand still, but in spite of its position. And the matter is made even worse by the way in which a detached column has been placed against the wall on either side of the painting, not near enough to form a niche for it — too near not to mar its effect. Possibly the columns are a decorative feature; they surely are not structural, for they are simple Classic shafts, with the cornice of the room broken out around them, and surmounted by meaningless decorative figures. Could anything be more unhappy — Rembrandt with a setting of Classic architecture, against a bare, blank wall, and in a Gothic building at that! The idea of the whole central arrangement — vestibule, corridor and alcoves — is excellent in every respect, but the culmination is too disappointing.

The rest of the gallery consists of simple, rectangular halls, all most admirably lighted from above, with the pictures arranged to such perfection that not one is lost or crowded into an unfavorable position. The small cabinets, *q* and *r*, across the front of the building are reserved for the small *genre* gems for which the Dutch school has been partial. The partition-walls of these rooms are drawn in as shown by the plan, presumably to throw a better light on the paintings, a scheme of doubtful advantage, as the difference would hardly be noticed in place. Excepting the Rembrandt room, which might be improved without very much difficulty, the internal arrangement of the gallery may be considered as on the whole a decided success; and it forms by far the pleasantest, and to the student the most easily accessible gallery in Europe. An exacting critic might complain that there is throughout rather too much room; that the paintings would gain by being placed closer together; that in places the magnificence of the gallery is apt to intrude itself upon the consideration of the art works it encloses. The decoration, too, is rather extreme; not in quality, however, for in general it is quite harmonious in tone and the details are good and well studied, perhaps even too well studied; but there is too much of it, too much little fretting of arch ribs and patterning over of wall-surfaces which ought to be plain, as though the artist had not been quite sure where he ought to stop. But the rich old draperies, seeming almost to be copied directly from Gerard Dow or Ferburg, quite atone for any other decoration and the net result is pretty sure to please.

There are some things about the Museum as a building which are of interest to the constructor as well as to the artist. It will be remembered that the greater portion of Holland is composed of alluvial deposits, and lies several feet below the level of the sea. Ordinary foundations are impossible, and in Amsterdam all buildings are supported by piles. The methods in vogue in the city are essentially the same everywhere, and are such as have been in use for centuries; hence a description of the arrangement of the piles under the New Museum would apply to similar work throughout the city. The piles vary in length from twelve to twenty metres, being driven down to a solid bearing. They are of pine, about twelve inches in diameter, and are spaced in rows across the lines of the walls, the distance apart of the piles being a matter of judgment rather than of calculation. The heads of the piles are tongued into a heavy cross-tie of oak, six inches thick, the ties being in turn connected by a pine stringer following the centre line of the wall. Four-inch pine planking is also laid across between the ties, and on these the brick foundation courses are begun, no stone being used. The sketches will make this arrangement clear. The piles are cut off at 1.15 metres below the level to which the water rises in the ground, which is nearly the height of the water in the canals. The finished grade in the case of the Museum is a little more than two metres above the water level, though most of the Amsterdam streets are within forty-five centimetres of the canal.



The superstructure of the Museum is very substantially built and is fire-proof throughout, iron beams and columns appearing to have been very little used, each floor being upheld by solid brick vaults. The stairs are of stone, the floors generally of concrete mosaic. The heating of the Museum is effected entirely by hot-air furnaces in the cellar, rather indifferently arranged and of doubtful practical efficiency. Ventilation flues are provided which lead from near the floor of the rooms to two tall chimneys. How they will operate is a question which has not yet been decided, as this is the first winter they have been used; but as far as could be ascertained by a rather hasty examination, the supply and exhaust-registers are placed so close together that the warm air will be quite likely to enter through one and pass out through the other, without either heating or ventilating to any appreciable extent. Such conditions can hardly be called favorable.

The architect of the Museum, Herr Cuypers, is also building the new central railway station on the Westerhoofd.

C. H. Blackall.

SITTING STATUES.—II.[1]



From a French Mantel Clock.

IT is a common remark among artists that none of the statues made by Mr. J. Q. A. Ward stand on their feet, or are supported by their legs. With equal truth can it be said that the Buckingham is supported neither by his body nor by his chair. For this reason, from a constructive point of view, the statue does not appear easy or comfortable, and soon becomes tiresome to the observer. It is deprived of its central and governing line.

The articulations of the figure as seen in the wrists, fingers, and ankles, are in keeping with the character of the model they were copied from. They bend rather than articulate. For the indescribable left hand we can find no equal. Such thick, boorish, nerveless hands, and dull fingers, are bad enough on a man, but hardly conceivable in a statue of a gentleman. They belong to a digger of canals, or to a scavenger. To oblige one of them to perform the elegant act of holding a manuscript, even though that manuscript be a meaningless one, as used in this statue, is a sorry enough sight; but to finish an arm in sculptured repose, with such a hand as is the left one, shows a lack of sensibility. But what can be said of the feet, those swollen and shapeless forms? The coat, short, poor in style, and ill-fitting, is copied as its wearer was copied, without taste, study, or artistic judgment. There is no part of it that is not tormented and uneasy in workmanship and movement. The back is more strained and disagreeable than the front, and at the hips and sides, where simplicity, firmness and constructive effect were particularly needed, there is nothing but meagre forms and characterless folds. Although the head is well set on the shoulders from a general view, yet from a closer inspection, from the front, the neck seems to stop at the collar. The trousers are also restricted in material, and constrained in their folds. The bend of the knee of the left leg, as seen from the right side, is pinched and disagreeable. From the front view the figure looks too much confined by the arms of the chair, still the chair, though heavy, gives a calmness and almost a dignity to the figure. The relation of a statue to its plinth, and to the pedestal that supports it, is one of the nicest problems in sculpture. It has been solved in this composition with no clearer perception than was exercised in the consideration of the statue. Everything about the statue required a thicker plinth, and some horizontal line immediately under the plinth, for two reasons: first, that the plinth, being a part of the statue, should support the statue, as well as show where it ended and the pedestal began; second, to prevent the pedestal from appearing, as it does in the Buckingham, to be a continuation of the plinth, and thus producing the effect of heaviness, and no indication of design. The pedestal and chair are the best things in the combination.

The whole affair shows that Warner had no serious or comprehensive understanding of the task before him, nor has he given any proof of earnest or intelligent study. He treats a portrait-statue, of a representative character, with the limited range of a young French sculptor, who makes figures for clocks. He began on the Buckingham, where he left off as a student in Paris, and got less out of it than he would have got at that time, because he would then have been criticised by his fellow students, and obliged to do better, if it had been in his power, than he has now done. On no part of it has he displayed, in more than a moderate degree, the qualities seen in his busts, and, in comparison with the Blair, it is nerveless and slovenly. It looks as though it had been worked over and over without intelligence and progress. The only indication he has given of his understanding of what a statue is, is the copying of a model, but even this is done without reference to the subject of his statue, and without taste, judgment, or imagination in his literal use of the model.

A chief characteristic of Warner's art genius, as well as its prime necessity, is rapidity of expression. Whatever he can do must be done at once, and then let alone. His first sketches have been almost invariably better than the subsequently completed work. The moment he hesitates, or begins to dwell on a work, it loses its warmth, grace and ease, and becomes labor rather than art. His first study of the head of Buckingham, in character and expression, was most excellent. The Blair bust was made in two weeks, and under unfavorable circumstances. The decorative heads and panels which he has made in terra-cotta, for various buildings, were executed at once and rapidly, and they are the best things of their kind, by far, that are to be found in the United States. To be unswervingly true to the first jet of his sensibility is a vital obligation he owes to his nature. He seems to have forgotten this in his statue. He muses, rather than ponders, and copies rather than designs. He dreams rather than thinks, and looks rather than sees. The sympathies as well as the antagonisms of large sculpture are strangers to him. In the Blair, he was bountiful and suggestive, in the Buckingham he is dry and narrow.

We do not blame the sculptor for any deficiency of temperament, but for the faults he ought at least to have tried to avoid. The faults of the Buckingham are not those inevitable in a strong art temperament, and consequently impossible to escape, nor of that kind which mark a progress toward something better. They are the faults of the inexperienced student to be corrected in the school-room. We dislike to believe that, had they been pointed out to Warner, he would not have hastened to rectify them. The suspicion, however, is forced upon us, in view of his determination to undertake to make the statue by himself, from the fear that if he received any assistance whatever he would be subject to the accusation made against our artists in Italy — that they were not the sole authors of their works — his aversion to criticism, his great self-confidence, and more than all, that he could suffer the left hand of the statue to exist as an expression of his ability, that he would have made nothing better out of the Buckingham, even if he had gone to Paris. These faults were anticipated by the friends who advised Warner to go to Paris to make his statue, but they confidently believed that once there he would surely overcome them. We now almost feel that in spite of Warner's clear understanding at an early age of what was necessary for him to do to become a sculptor, his uncommon determination and preseverance in carrying out his purposes, and his unique experience in Paris as a student, that when he left Paris he had probably gained all he could from study with others; that the charms of a continued student life did not affect him; and that the invitation to become a worker in Carpeaux's studio instead of being in harmony with his nature was antagonistic to a self-confidence that had already taken possession of him, and led him to prefer the uncertainties of a locality where there was none greater than himself to the influences of a world where constant progress is the only passport to professional respect. It was, therefore, best for him to return to his own country and escape the self-abnegation to which he would have been obliged to submit in order to have made progress amid the unceasing competitive strife which is a living element in the studio of a great sculptor.

So far as progress in bust-making goes, his decision has been justified. The qualities of his busts are not those that can be acquired, but are the admirable expressions of his artistic individuality, an individuality too limited in scope to successfully serve in the execution of a statue like the Buckingham.

In the matter of self-confidence and self-dependence, Warner is the counterpart of Ward. Both depend upon themselves alone, and both fail to give any evidence that they possess the ability to gain anything from others, or that their love for sculpture extends beyond their limited power of production. They are also alike in their inability to be impressed by, or to comprehend, the nature or significance of the character of the subjects they treat in statues. Both are lacking in imagination. Ward endeavors to make up for it through extraordinary attitudes; Warner, by an unobtrusive and meaningless simplicity. The Buckingham and the Putnam fully illustrate the qualities of their authors. Ward makes a literal copy of the forms he uses to execute a statue. If it is cloth, silk, metal or leather, they are reproduced as such, and remain imitations of those materials. Warner, with more sense of sculpture, tries to produce an effect of sculpture out of these materials. He sees and feels them from the point of view of an artist, while Ward looks at and reproduces them as an imitator. The Buckingham sits on its shoulder-blades; the Putnam is suspended in the air. The Buckingham is distinguished by its left hand; the Putnam by the anxiety to show the lion's head on the sword's hilt. The astonishingly vapid idea of General Putnam, as selected by the sculptor, when compared with his life and character as a ready and great fighter and successful general, will always make this statue a subject of ridicule; while the Buckingham will pass unnoticed, because it has no idea. The Putnam has been, from the time of its erection, popularly and justly dubbed a flunkey, holding his master's accoutrements. Ward is a better and harder-working student than Warner, and his work will be admired by thousands, where Warner's will be by dozens, of people. One will be criticised and ranked, eventually, as being no more than a workman; the other will be recognized as an artist.

While the busts, medallions and decorated heads that Warner has made could not perhaps be considered sufficiently comprehensive in their scope to take the place of an elemental contribution in the development of sculpture, still, in view of the extreme rarity in our sculpture of the sculptor's temperament, or of any essential quality of that temperament, the large number of persons who are engaged in the production of what we call sculpture, and the immense number of statues and monuments produced in this country during the past twenty years, the appearance of a man like Warner is of unusual

[1] Continued from No. 530, page 88.

interest, and gives him a claim to a consideration due but to a very small number of those who have been connected with the history of our sculpture. With the exception of a certain illustrative tendency,



Group of Working-woman and Child, on base of a Monument at Creusot, France, erected to the Memory of the Proprietor of a great Iron-works. — Chepu, Sculptor.

the most definite examples of which are seen in the statuettes of John Rogers, the statues made by American sculptors have been sadly wanting in personality, design, composition, and the expression of art in modelling. Since the time of John Frazee, who had a vigorous appreciation of art in form, and an extraordinary constructive nature, we have had but one sculptor, Rinehart, who has succeeded in demonstrating that he had the nature and temperament of a sculptor. (We do not include Dr. Rimmer, who was in some very great respects greater than all our sculptors put together, in the present consideration.) Neither Frazee nor Rinehart carried the expression of impression and modelling so far as Warner has. His sense of form, susceptibility to the impression of a head, and concentration of character in a head far exceeds theirs, though Frazee had a power of construction and appreciation of large forms so much greater than either Rinehart or Warner that one is tempted to say that they have none at all; while Rinehart has a comprehension of the figure, an understanding of its composite necessities, and the human element of art, far superior to Warner or Frazee.

As far as Warner goes, his modelling is more pleasing and better sculpture than that of any of our sculptors. He has succeeded in expressing a more legitimate and harmonious art nature than any of them. The most significant and conclusive evidence of the strength of his nature, even against unfavoring circumstances, is shown in the fact of his continued improvement after his arrival in New York, in 1872, until 1883, when the Blair bust appeared.

It is a curious fact that very few of our artists who have studied in Europe have been able to make progress after their return to America. They often continue to improve in skill, in power of delineation, and in smartness and audacity of workmanship; rarely in the enlargement, refinement and strength of the art sensibilities. Warner has done this; he has grown in sensibility, in power of modelling and in art appreciation. As far as he has gone in his work he has borrowed nothing. The sensuous charm of his best modelling, as seen in the Blair and Cottier busts, is so much superior to that of any other American sculptor, that one is inclined to give him a higher place than he really deserves. With the exception of the Buckingham, we believe that his work is the best and most legitimate contribution yet made to our sculpture, and as likely to be appreciated, perhaps more likely than if it were of some other character. Of the sorry need in our sculpture of the poetry, sentiment, grace, ease and sensuousness of form, as well as fine modelling, there is no question. Our sensibilities having been hitherto contented with and charmed by the effect and fact of material alone, it is just to suppose that we shall be willing to accept the added quality of beauty of workmanship, whenever it shall claim our attention, or become a vital need in our progress of love of form in art. Although design, idea, style of illustration, understanding of subject, and modesty, have characterized, either singly or together, the beginnings of sculpture in other times and among other peoples, and beauty of form and delicacy of touch have been added at a later development, it may be that with us this procedure will be reversed.

The permanent interest of Warner's work will depend upon that which succeeds his. If other men appear who have the qualities he lacks, and they succeed in laying the foundation of our sculpture, then he will have been its fortunate forerunner. But if others appear who have the same qualities he has, combined with the larger qualities of design, then he will have been simply an isolated expression of his peculiar talent. T. H. Bartlett.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

CHATEAU DE JOSSELIN, BRITTANY, AFTER AN ETCHING BY A. GUILLAUMOT.

This, one of the finest châteaux of the Renaissance, is built on the bank of the river Oust, in the department of Morbihan. It stands on a steep rock, and in its day was an important military stronghold. The exact date of its erection, or the name of its builder, are not known, but it is most probably fifteenth-century work. It was one of the mansions of the illustrious family of Rohan, whose arms may be seen among the delicate and luxuriant carvings on its front. The initials "A" and "V," repeated prominently with the motto "*à plus*," undoubtedly stand for "*Alain, vicomte*" (de Rohan). Our illustration shows the court-side only, whose rich and varied ornamentation forms a strong contrast to the severe and warlike aspect of the river-front, with its three strong, round towers. The château underwent important restorations a few years ago. The etching, which we reproduce, is the work of Auguste Alexandre Guillaumot, who has won several medals at the *Salon.* He was born in Paris, and studied under Lemaitre. He has executed many plates of architectural and monumental subjects, and, in 1875, published a monograph consisting of twenty etchings, by himself, after Watteau and other French painters of the eighteenth century. These plates show examples of the monstrous head-dresses in vogue at that time, taken from designs in the collection of Victorien Sardou, the dramatist. Guillaumot etched the plate of the Château de Josselin, after a drawing by the late accomplished artist, M. Leon Gaucherel.

THE STANDARD OIL COMPANY'S BUILDING, NEW YORK, N. Y. MR. E. L. ROBERTS, ARCHITECT, NEW YORK, N. Y.; AND THE WELLES BUILDING, NEW YORK, N. Y. MESSRS. G. R. & R. G. SHAW, ARCHITECTS, BOSTON, MASS.

[Gelatine Print, issued only with the Gelatine Edition.]

The front of the Welles building, at the lower end of Broadway, is built of Jonesboro' pink granite. The floor-beams, fifteen inches deep, in spans of about thirty feet, are carried on brick-walls sixteen inches thick above the basement: there are no columns or piers in the building. Between the floor-beams are hollow-brick arches plastered on the under-side. The door and window finish are of Portland cement. The pitches of the roof are covered with copper, and the flats with Neuchatel asphalt. One motive we have in publishing this illustration, is to put on record a fairly-good instance of the manner in which street architecture is now marred by telegraph poles and wires.

THE MONTALBANS-TOREN, AMSTERDAM, HOLLAND.

[Gelatine Print, issued only with the Gelatine Edition.]

This structure, which used to form part of the fortifications of the city, is now merely an ornamental feature of the city.

SKETCH FOR A COUNTRY-HOUSE. MR. FRANK E. MEAD, ARCHITECT, PHILADELPHIA, PA.

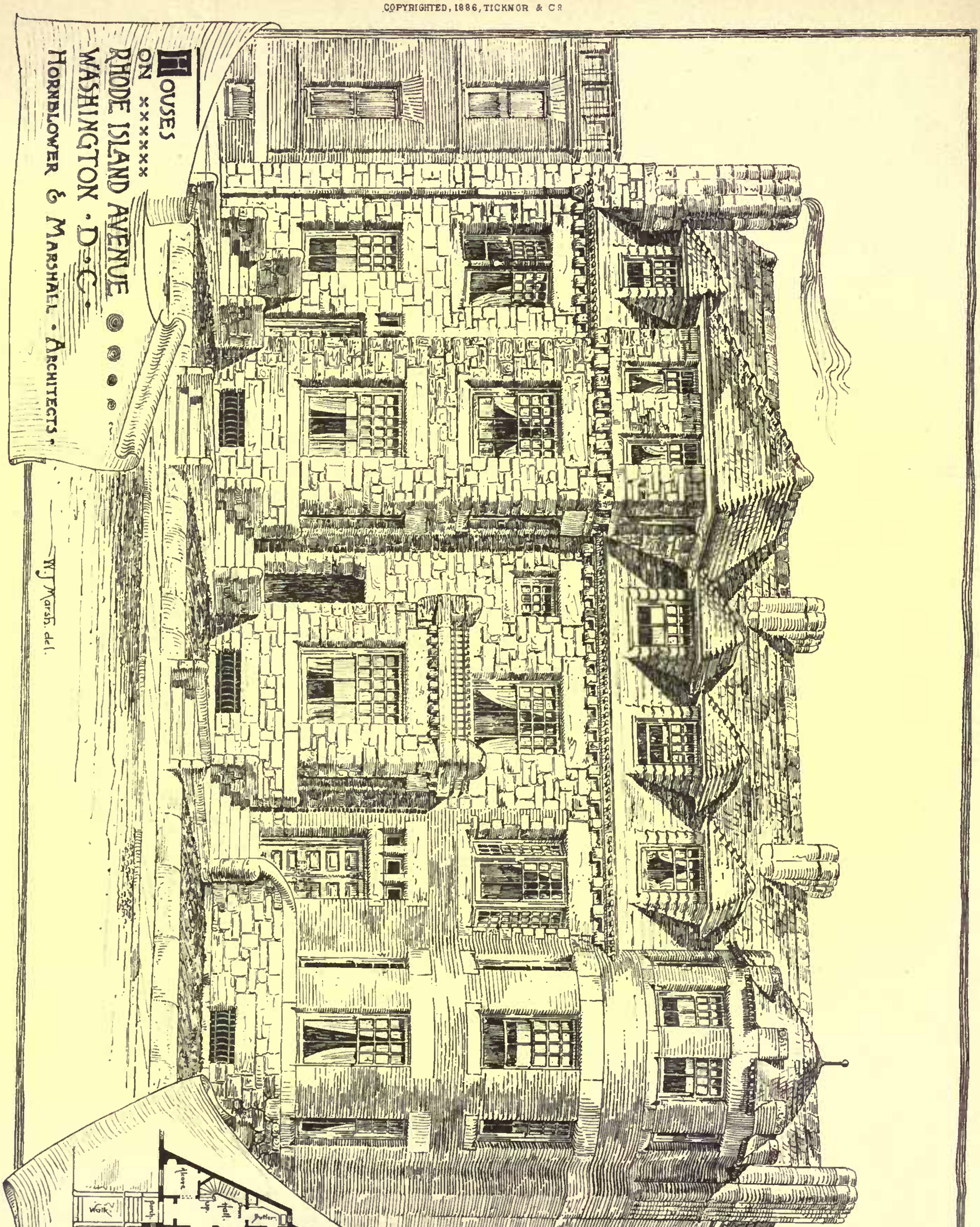
This house is to cost about $20,000.

HOUSE OVERLOOKING WHITEMARSH VALLEY, NEAR PHILADELPHIA. MR. T. P. CHANDLER, JR., ARCHITECT, PHILADELPHIA, PA.

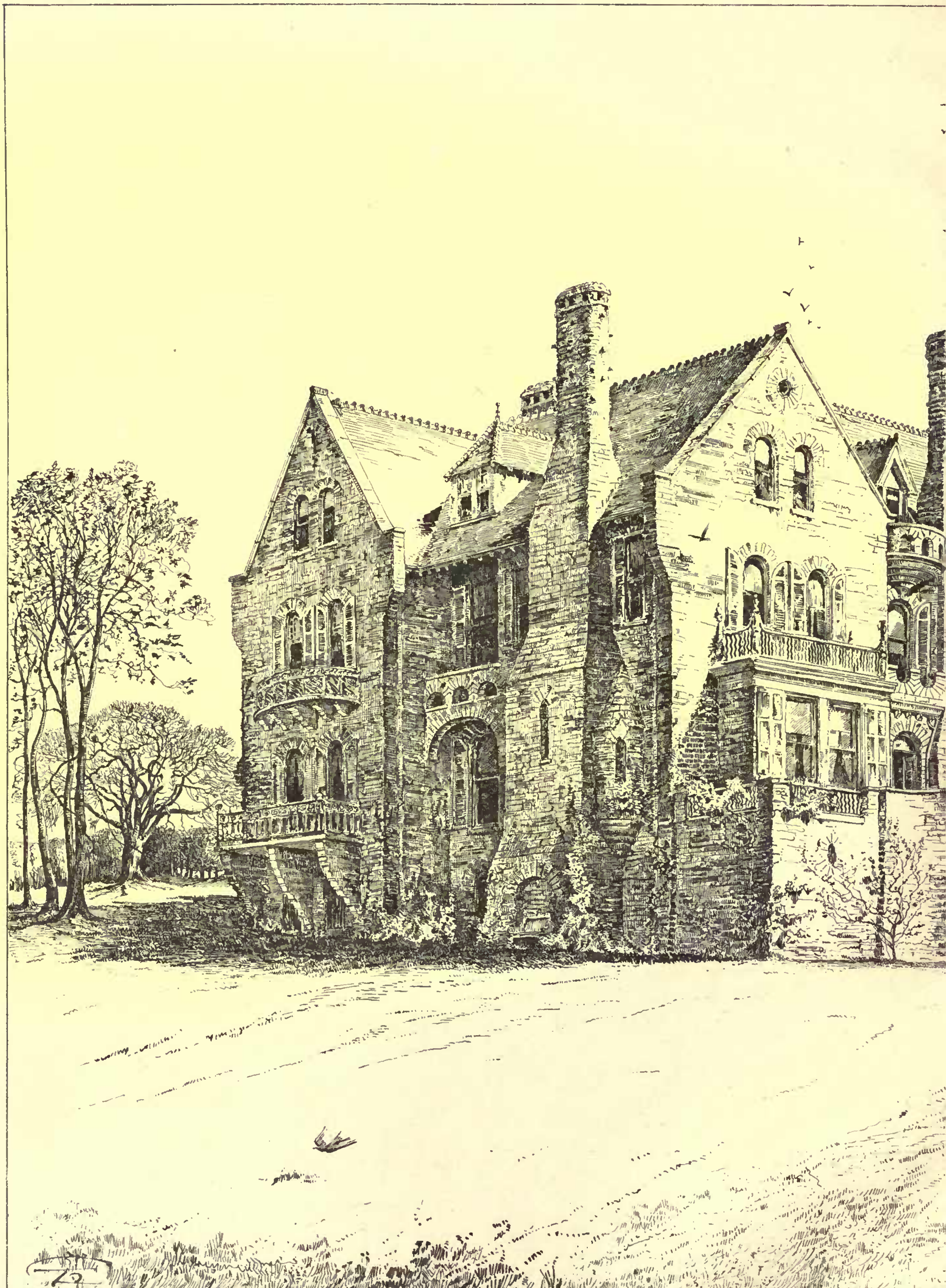
HOUSES ON RHODE ISLAND AVENUE, WASHINGTON, D. C. MESSRS. HORNBLOWER & MARSHALL, ARCHITECTS, WASHINGTON, D. C.

The Roman Arena at Paris. — The site of the Roman arena in Paris has revealed indications of the use of water to flood the arena for the purpose of water-sports and sham naval battles. Fragments of seats, with the names of their holders engraved on them, have also been found, and a woman's head in stone, with a fillet of bay-leaves about it. — *New York Times.*

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THEOPHILUS P. CHANDLER JR.
ARCHITECT. PHILADA.

RESIDENCE NEAR PHILADELP

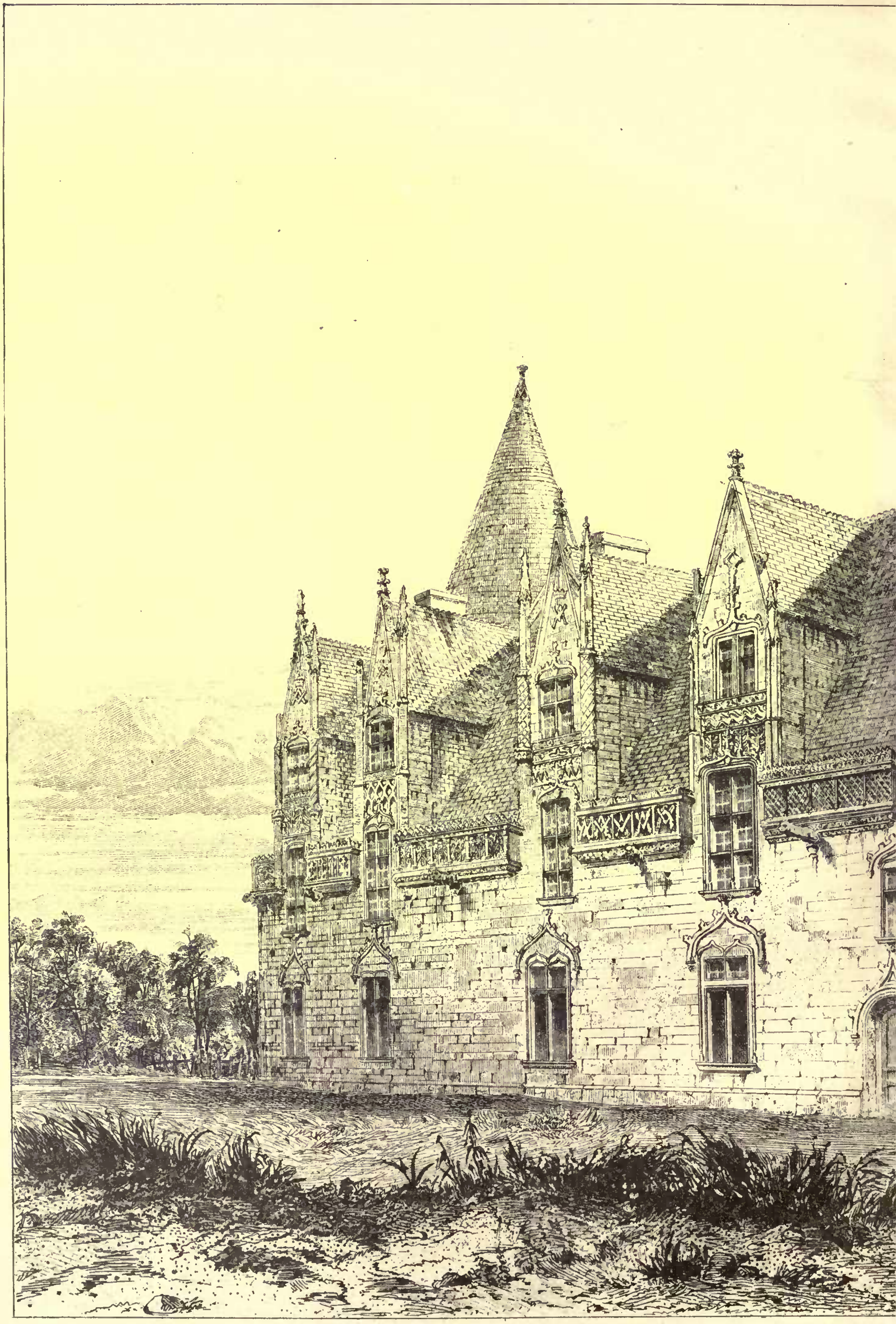
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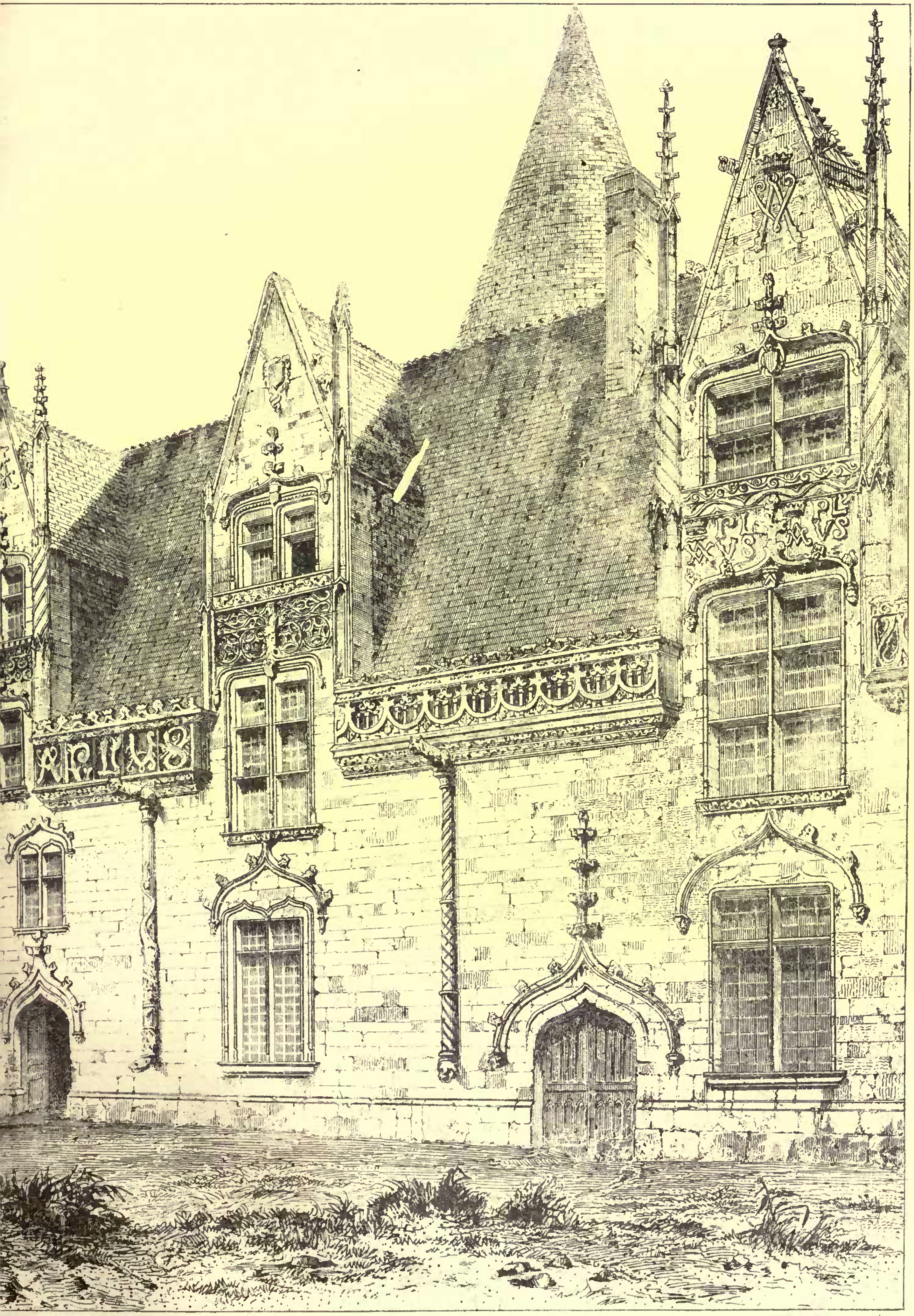
VERLOOKING WHITEMARSH VALLEY.

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Leon Gaucherel del.

CHATEAU

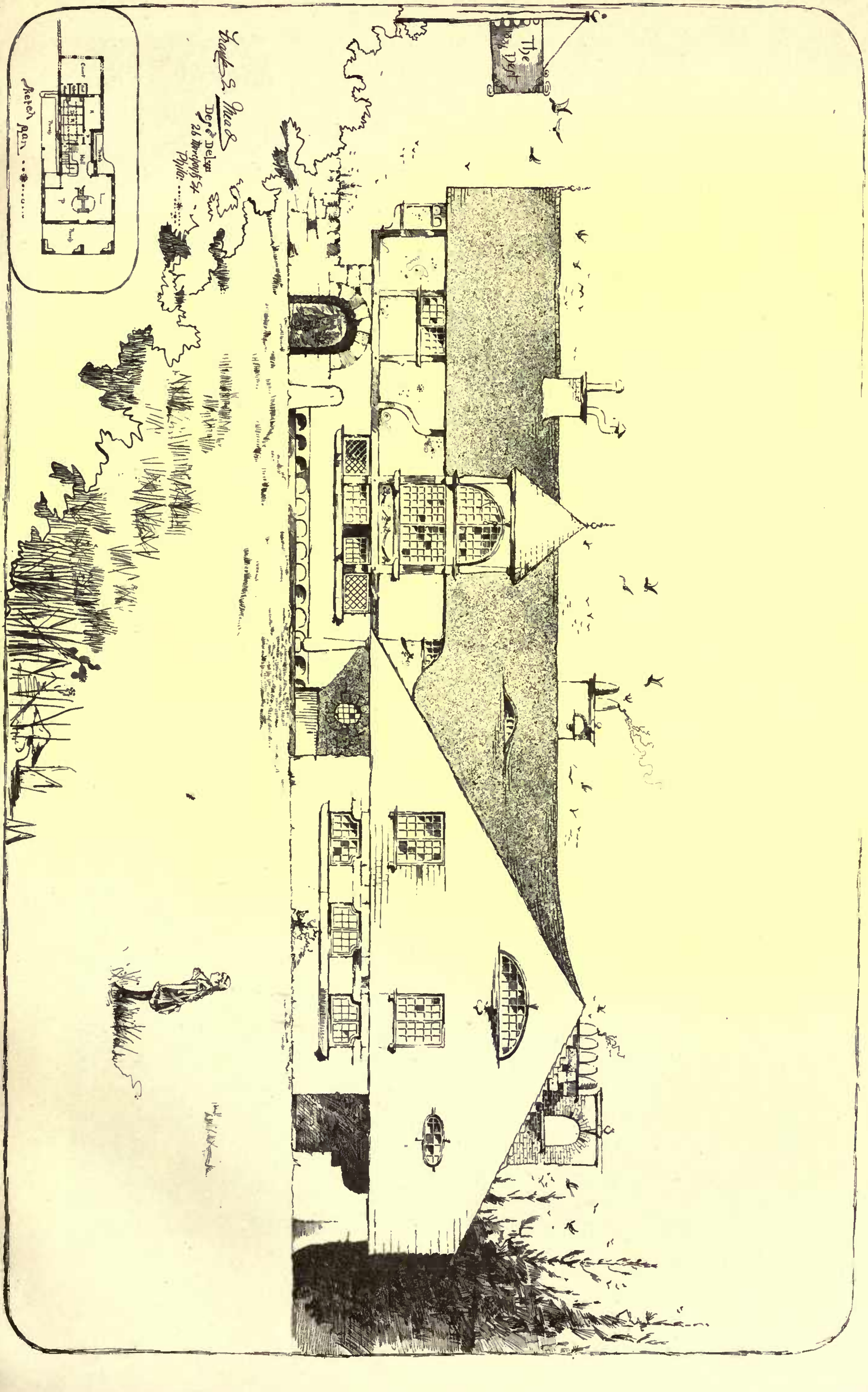


Architectes.

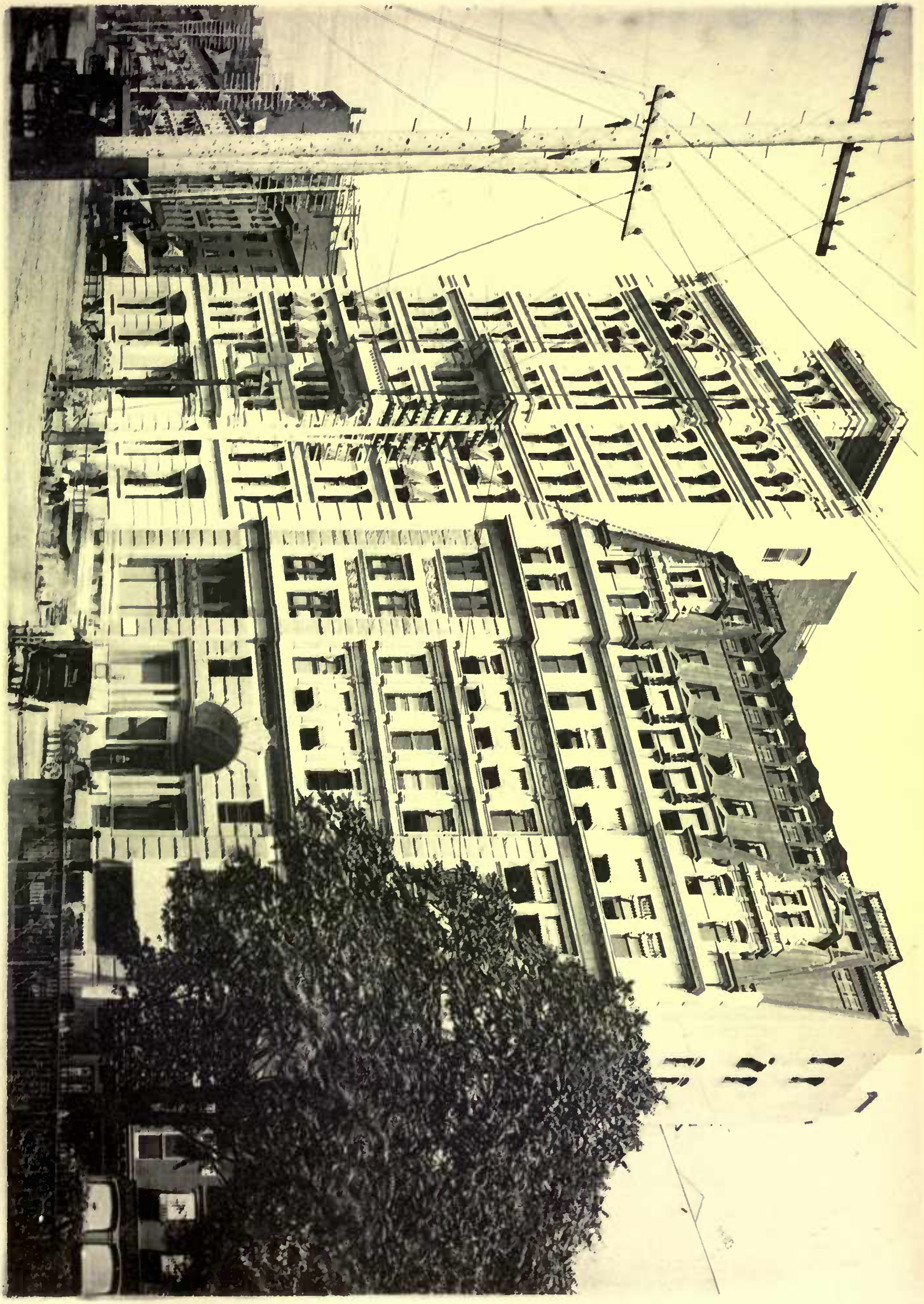
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JOSSELIN

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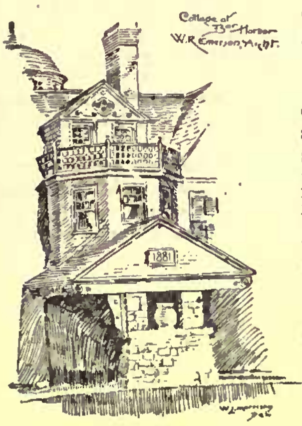


THE STANDARD OIL COMPANY'S BUILDING.
E. L. ROBERTS, Architect.

THE WELLES BUILDING, BROADWAY, NEW YORK, N. Y.
G. R. & R. G SHAW, Architects.

Photo-Gravure Co., New York.

PICTURES OF THE SEASON IN NEW YORK. — II.



THERE are two satisfactory points to be noted with regard to this year's Water-Color Exhibition, (which is the nineteenth since the foundation of the Society). The first is the average excellence of the work, considered from the most purely technical point of view — considered simply with regard to the way in which our aquarellists have learned to handle their medium. Even when the result is weak in every other direction — weak in line, in composition, in color and in idea — it most often shows an understanding of the way in which water-colors should be used, and a manual skill in putting this knowledge into practice, which are certainly not without their value, at least to those who care for the possible future, as well as for the visible present, of our art.

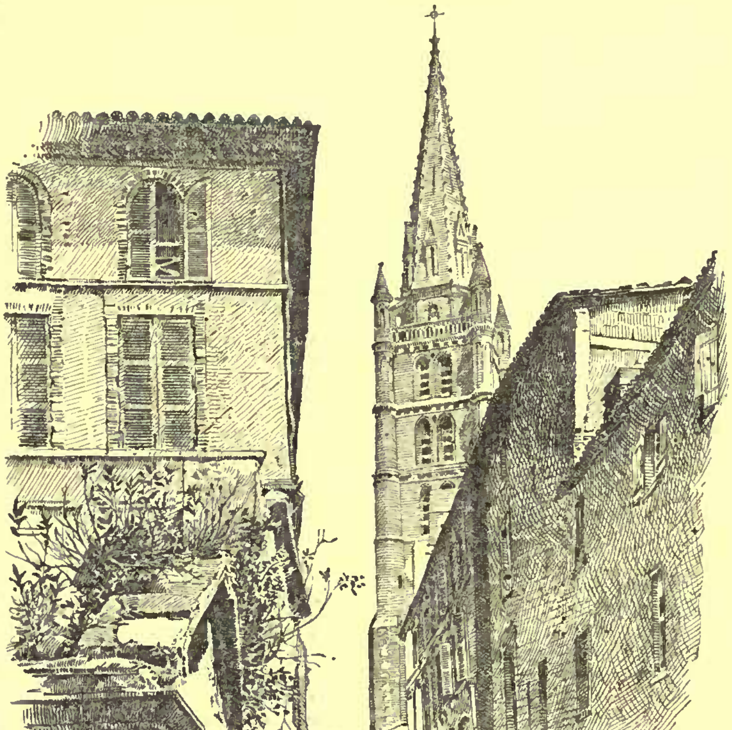
The second point to which I have referred, is the frequency with which the figure was attempted. Never before, upon these walls, did so many figure-subjects mingle with the landscapes. And never before, I should say, did they come so near to including all the best work of the year. This is not to state that all of them were good, or that more than a few were very good. But the average was not discouraging, and one or two examples were of the greatest interest.

A word or two first with regard to the landscapes. Mr. Homer Martin sent a charmingly-delicate little study, which unfortunately came too late to be catalogued, or to be hung elsewhere than on the staircase; Mr. Ross Turner's best contribution was "Low Tide," a shore-view as charming in color as manly and clever in workmanship; Mr. Farrar and Mr. Quartley were about as usual, while Mr. Hopkinson Smith was scarcely less prolific, but much less interesting than in former years. Mr. Crane and Mr. Bolton Jones repeated themselves, as they have too long been in the habit of doing, but with sufficient grace to leave us not ill-content. Mr. Dewey was softly poetical and suggestive, with less of nature in his result than of a sentiment which is undoubtedly genuine with him, but seems a trifle meretricious to some observers. Mr. Baker, on the other hand, trusts most to nature and least to himself. His "November in the Woods" was the veritable realization upon canvas of his theme, almost devoid of personality, yet artistic, by reason of its admirable workmanship — extremely detailed, and yet as broad and free as one could ask. I should say there was no better landscape on the walls than this.

A name quite unknown to me — E. D. Boit — was signed to two large Parisian street-views that seemed to be extremely clever, though, as both were most unjustly "skied," they did not attract the attention which would undoubtedly otherwise have been bestowed on them. In color they were as truthful as charming, or perhaps, I should say, in tone, for of color, specifically so-called, there was little mingled with their harmonious whites and grays. And in execution, so far as one could judge under the circumstances, they were very spirited and fresh in the true Parisian "blotty" style. Mr. Ranger's studies of New York streets were very different, but in their way were equally interesting. His affinities are rather with the new Dutch school of aquarellists than with either the French or the English. He seems to prefer very low tones, and effects of mist or rain; and though he misses, as yet, the luminousness which the best among the Dutchmen preserve in despite of these, he gets almost all their other qualities, and is especially successful in achieving pictorial interest while treating the most homely themes in the most uncompromising spirit. His rendering of a rainy evening on Christopher Street seemed to me very remarkable, and not alone because one is always ready to welcome the straightforward effort to "do something" with home materials. I should think that Mr. Ranger's success would greatly encourage such efforts among our New York artists. His material is certainly as good as that which some others have gone very far afield to find, and his results are certainly better than are most of theirs. Mr. Hassam was not as interesting as in the water-color I referred to when speaking of the Prize Exhibition; but his "Beach at Scheviningen" came near to being very good, and his large view of a path beside a river was very accomplished, though rather dull as regards its theme.

In the way of still-life there was not very much to note save a charming small study by the Dutch painter Bastert, and several beautiful drawings of roses by Mr. Alden Weir, very low in tone and vague in drawing, but full of a sentiment and charm as undefinable as they were potent. A larger drawing, called "The Wounded Dog," was marked by the same qualities, and in an even more elusive, undescribable way. Mr. Lippincott sent a number of works of various kinds, in which his extremely clever technique was not sustained by any very marked excellence of other kinds.

Passing now to the figure-subjects proper, I shall only try to note a few of those which were more or less deserving of attention. Mr. Beckwith sent a beautifully-painted, but wholly unattractive, female head; Mr. Quartley a fine little study of women washing pots in Cornwall; Mr. Hyde a very clever, but very vulgar, sketch of a dishevelled young man with a cigarette in his mouth; Mr. Church two of his well-known fantasies, the larger not very successful in character; but the smaller, called "White Peacocks," a wholly charming bit of decorative trifling; Mr. Weldon a beautifully-handled, but rather inane, large figure called "Incense," in which the effect of floating motion was admirably suggested; and Mr. Percy Moran several costume-studies, also beautifully-handled and also inane. Mr. Blum sent from Holland a picture of two women sewing near a window, which recalled the excellent pastels of similar subjects he exhibited a couple of years ago, but which was a little too spotty and muddy to be quite their equals. Mr. Smedley's contributions were a distinct disappointment, they were so much less vital in sentiment and so much less strong in execution, than those of a few years ago. Mr. Leon Moran sent two little drawings, each of a single figure in last-century costume, which were quite perfect in their way — lovely in color, excellent in drawing, almost impossibly dainty, yet accurate in execution, and sufficiently good in character to give them an intellectual claim to existence. Signed by some famous French name — which they would not disgrace — their value would doubtless have been more perceptible to the public. I do not know whether Mr. Keever is one of the new Dutchmen, or an American who is studying among them; but in either case his Dutch peasant subjects were a welcome addition to the interest of the exhibition. Perhaps the best of them was "Mother's Care," in which the sentiment, without undue imitation, suggested Israel's, and the scale of color was also not dissimilar to his.



Eglise de la Dalbade, Toulouse, France.

But much more conspicuous than any of these was Mr. Abbey's large picture, called "The Old Song," which should, perhaps, be placed on record as having been sold for the largest sum ever given (or, I imagine, asked) for an American aquarelle — $3,000. Its faults were immediately apparent; the composition was too scattered for pictorial unity, and the chief figure (that of a young girl playing on a harp) was not very well characterized; but its merits were as undeniable. The old couple, sitting in the background, were a marvel of beautiful handiwork and of tenderly-poetic characterization, and the charming old-time accessories were painted more charm-

ingly than even Mr. Abbey himself had ever painted such before. It was not a completely successful picture, as I have said; but in its incompleteness it was a wonderfully delightful and artistic one.

The honors of the day were divided by this, and by Mr. Chase's "Summer Afternoon in Holland." I am almost afraid to say how good and how important a work this appeared to me, for I found that, to many eyes, it had neither virtue nor value. But, let me hasten to add, these were the eyes of that "general public," from which one hardly expects to get recognition for anything new and unexpected — for anything true and good, if its truth is unconventional and its excellence is not "pretty." Those who are better able to see and better entitled to speak — the artists and the critics, and the veritable amateurs of art — these (so far as I know, and I was at some pains to inquire,) were unanimous in their praise of the remarkable technical qualities of the picture. Perhaps it would have appealed more to the public's sympathy had its superficial aspect not been so unlike that of the drawings about it as to excite many protests against its presence in a water-color exhibition. It was a very large picture to find just where we found it, the foreground figure being, I should say, about two-thirds life-size. Moreover, it was executed on canvas and set in a heavy, bronzed frame, quite as though it had been in oil. And it was so painted, finally, as to look more like an unvarnished oil than like an aquarelle. The chief medium used, in fact, was more properly to be called distemper than water-color, the tints having been mixed with egg and vinegar, and being, of course, opaque. But transparent color had also been largely employed; and there was really no reason (except that it killed everything about it) why it should not have been esteemed perfectly in place in a water-color exhibition; especially as Mr. Church's work, which so long has figured in such exhibitions without any one's protesting, is executed in practically the same manner, save as regards the use of canvas. The advantages of the process, I believe, are that it permits of more rapid work than oils, and of more full and solid modelling than pure water-colors; at all events, it was amply justified by its results in this present instance. Nothing could have been more solid, yet nothing fresher; and the handling was of Mr. Chase's broadest and best.

The scene was the back-garden of an inn — such a garden as every tourist has found a hundred times both in Holland and in Germany. There was the broad path of pinkish gravel, with its borders of ragged grass and cockney-flowers; there was the small, square table, with its white cloth and blue-and-white coffee-service; there were the thin, black wooden-chairs, and there were the sturdy tree-stems and the thick foliage filling all the upper part of the canvas. At the table, rather far removed from the actual foreground, sat a young man in white flannels, one arm thrown over the back of his chair, and the other hand outstretched upon the table and trifling with his cup. Beyond the table and chairs a gaily-fringed hammock was swung between the trees, and in it lay, her face but half-visible, a young woman in a pink dress and the daintiest of black slippers, with her head resting on a blue cushion. The background showed a fence and a water-butt, a hobbling old woman and a piece of red brick-wall, and a longer, whitish wall, with an open door and a glimpse of a shadowy interior beyond. And over all, and behind and around all, was a flood of sun-steeped light, breaking here and there into flecks of actual sunshine.

If I have dwelt in a dry reportorial fashion upon the items which went to make up the picture, it is because I wished to explain as clearly as I could its technical qualities and what seemed to me the further qualities that were involved therein. The first thing that struck one was the straightforward, simple realism of the canvas. It was so realistic, both in motive and in treatment of motive, that a photograph taken from it looks marvellously like a photograph from nature. It was so realistic that it hardly seemed as though it could be artistic. And yet it *was* artistic — to my eyes most eminently so; and if we analyze a little it was not hard to see how and why.

In the first place, the composition, while apparently so unstudied, had really been studied with the nicest instinct. Then the color, though apparently rendered with a single eye for truth to apparently casual notes, had really been arranged upon a most skilful scheme — the various notes of strong red and pink and white and green and black being balanced and carried in among each other in a very subtile and artistic way. Again, though there was no apparent striving after tone, entire harmony had been secured as it is not always secured even when tone in the conventional sense has been the main thing sought for. Such criticisms are all but useless when the actual canvas is not at hand for illustration; yet I must just add that the way in which the different values of the different notes of black had been given so as to preserve their individual truth and also so as to get the accentuations needed in the color-scheme as a whole, was a veritable lesson in the painter's art; as was also the treatment of the very prominent white notes coming into close contact with one another — the yellow-white of the flannel costume and the blue-white of table-cloth and collar and gaiters and newspaper.

But the finest thing in the picture — that which made it a fine picture, in fact, and not a merely clever study — was the manner in which light and atmosphere had been realized. Such realization had evidently been the painter's chief aim, the very *raison d'être* of his choice of subject and of medium; and he had succeeded in it to a degree which I have never seen surpassed — not by any of the most famous of those modern brushes which devote themselves most seriously to "out-of-doors." It was not only light and sun and air that he painted — it was *afternoon* light and sun and air and color, so palpably and unmistakably that even the picture's simple title was quite unnecessary to our comprehension. I overheard one young lady (more perspicacious than most), exclaim: "You don't merely see it all — you *feel* it all. I know just how hot it is and just how everything smells!"

But even some of those observers who most cordially agree with me as to the technical success of the picture, say that it had no further claim to praise — say that it was an extremely clever piece of handiwork and nothing more. To me it seemed a good deal more. In the first place it seemed to me that to paint light and atmosphere so well was in itself *not* a mere technical feat like the painting, for example, of some difficult texture. To paint light and atmosphere is not only to paint those things which of all inanimate things are the hardest to paint, but those which are the best worth painting, and those, moreover, which most emphatically demand from the artist something beyond mere manual skill. To succeed in painting air and sun-light implies, I think, that the painter has had artistic feeling as well as an artistic eye and hand; implies the presence in his organization of something more personal and more sensitive and more emotional than is implied in the good painting of anything else save only the human face with a soul behind it.

Nor did the figures appear to me to be without a degree of vitality, of personality, of human interest — of character, that is to say — amply sufficient to justify their sincere approval in another way than as mere furnishings to the canvas, mere occasions for effects of light and color. The man's attitude had an expressiveness which was echoed in its face. The listless pose and the abstracted gaze were full of suggestions and these were repeated in the half-concealed figure of the girl, and cleverly but not obtrusively emphasized by the accessories — by the abandoned newspaper, for example, and the many cigarette stumps which strewed the path. The figures, in short, were not only vital, so to say, in mind and body, but harmonized with and definitely enhanced that expression of afternoon languor which was so well suggested by the light and color. If we wanted "realism" in a picture — and are we not alwaws asking for it, asking for the straightforward, unvarnished portrayal of modern life in its ordinary aspects? — this picture certainly supplied it. And if we wanted, besides, sufficient sentiment to make the realism *art* and not photography — if we wanted not sentimentality and not "literary" subject matter, but some feeling and idea upon the artist's part which should excite our feeling and awaken our interest in return — I at least could find it, too. It was vague sentiment, if you will; but unmistakable and sufficient, and to me very attractive. The painter had wished to reproduce an aspect and a mood of warm, languourous, aimless indolence; and he had succeeded — in his figures as well as in his atmosphere and color. And the fact that no definite title strove to accentuate or enforce this sentiment was a great advantage. The figures were expressive enough to provoke the imagination, and the imagination was not hampered or contradicted by anything less elastic than their own suggestiveness.

I have dwelt so long on this picture that I have no space left to speak of Mr. Chase's other contribution — a "Spanish Dancing-Girl," executed in the same way and also very large. Technically it, too, was most successful but neither in individuality of mode nor in pictorial interest, properly so called, did it seem to me the equal of the "Summer Afternoon."

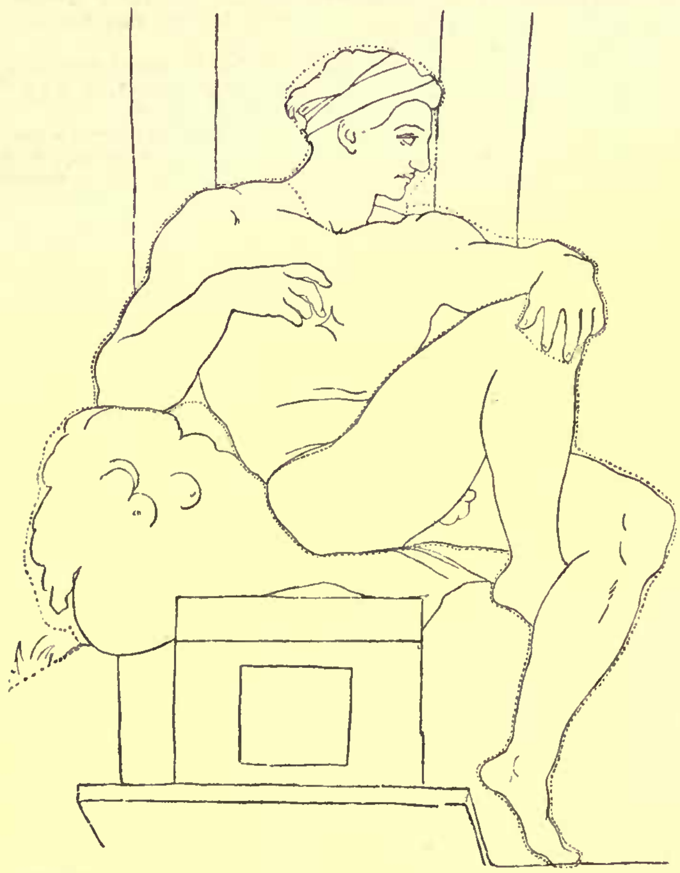
The Etching Club exhibited as usual in combination with the Water-color Society, and its rooms contained many items of great interest. Chief among them were Mr. Platt's and Mr. Parrish's plates and a Venetian view by Mr. Duveneck. The reproducti e etchings for the Morgan Collection Catalogue were, of course, not to be compared with similar things produced in Paris. But they were far better than one could have expected, very far better than anything that could have been produced here even a few years ago; and some among them were entirely successful. Reproductive work in general was more frequent and more accomplished than ever before. But as a set-off to all promising facts one must note the tendency which we have recently developed to etch large showy engraver-like plates conceived with the desire to catch the public eye with something "nice to frame," rather than with the desire to etch for the sake of etching or for the eye of the genuine amateur. Only Mr. Peter Moran's essays in this direction justified themselves by success in their own line; but these were so accomplished and so charming and so etcher-like in spite of their pictorial elaborateness that if all others had been as good we might, perhaps, have felt no strong impulse to protest against the manner of their conception.

M. G. van Rensselear.

Earning Gratitude at the Expense of One's Heirs. — Signor Martini, one of the largest owners of house property in the city of Genoa, had a feeling of gratitude to his tenants, who, by their regularity of payment, had enabled him to spend his declining years in comfort. When his will was opened, it was discovered that the old gentleman had instructed his executors that all his tenants, rich and poor, male and female, were to reside, rent free, in the houses then occupied by them, if they desired to do so, as long as they lived.

MURAL PAINTING.[1]—VI.

FRESCO.



FRESCO is an Italian word that means fresh. Fresco painting means painting on fresh, wet plaster. "*Buon fresco*" means real fresco as distinguished from the false. All sorts of mural paintings, from distemper to encaustic, are indiscriminately and wrongly called frescos. This generic use of the word is as unnecessary as it is improper, and tends to create confusion. When the word fresco is used in these papers, it will be employed in its legitimate and restricted sense, viz., to paint on fresh plaster.

I shall now endeavor to explain in a few simple words the principle of fresco painting, well knowing that the artistic mind recoils from an over-dose of the incomprehensible terminology and concise formulas in which scientists revel. If these last only knew what harum-scarum brains were ours, they might pound some useful information into them by the assumption of an extreme simplicity. As it is, we frequently run at the first discharge of the chemical battery.

Pure limestone consists of carbonic acid and lime = carbonate of lime.

The limestone is subjected to heat, the carbonic acid is expelled, and there remains lime.

If to this lime, water be added, the result will be hy drateof lime. Only a certain amount of water combines chemically with the lime, hydrate of lime being a powder. The rest of the water mixes with it mechanically.

When hydrate of lime is exposed to the air, the water is expelled by carbonic acid, and the result is again carbonate of lime, or the original limestone, chemically speaking, for practically the cohesion of limestone is never regained.

Sand is usually mixed with the liquid lime to augment its cohesiveness. The latter acts chemically, but very feebly so, on the former. The mixture is chiefly mechanical.[2]

The pigments are applied while the wet plaster is drying and hardening; that is, while the carbonic acid is expelling the water. The painting must be finished before its expulsion is complete. A thin crust of carbonate of lime will then be formed over the painting, protecting it from water and moderate friction. If the painting be continued after the plaster has lost the greater part of its water, no crust will be formed, and the pigments will be deprived of their natural protection. Moreover, when dry, they will exhibit chalky spots.

Fresco, then, is durable, not because the colors are absorbed by the plaster, as many erroneously suppose, but because they are protected by it chemically.

HISTORY.

The birth of fresco is unrecorded. It is certain that the Greeks worked in it. The discussions have been long and sharp on the methods employed by the Pompeians in their well-known mural decorations. The best and most recent authorities decidedly pronounce them to be frescos. From personal observation I can give no opinion, for I have no other ground on which to build a theory than deceitful memory. One must be on the spot to arrive at a definite conclusion. While there is no good reason for doubting the authoritative statements of those who declare the paintings to be frescos pure and simple, yet one cannot blink the circumstances that tempted the less scientific to pronounce them encaustics, or frescos waxed and cauterized, the most weighty being their astounding freshness when first unearthed. Damp is disastrous to frescos, and here are paintings that have been buried some eighteen hundred years in a not over-dry region almost as fresh as when first painted. MM. Cros and Henry say that no traces of wax, save that of modern application, can be found on these pictures, with the exception of two or three fragments covered with vermilion, a color usually protected with cauterized wax and oil, as Vitruvius recommends. The highly polished surfaces that I call to mind must be the result, then, of the modern and ineffectual attempts to preserve the paintings with a coat of wax or some other process unbeknown to me. But these things cannot be studied from a distance. Vitruvius has a great deal to say about plastering, and very little about the process of fresco painting, but enough to convince us that the usual process for mural painting in his day was fresco — even were certain unmistakable peculiarities of fresco painting wanting in the pictures that have been preserved. "When, besides the first coat, three sand-coats at least have been laid, the coat of marble-dust follows, and this is to be so prepared that when used it does not stick to the trowel, but easily comes away from the iron. Whilst the stucco is drying, another thin coat is to be laid on; this is to be well worked and rubbed, and then still another, finer than the last. Thus, with three sand-coats and the same number of marble-dust coats [not counting the rough-cast, which was allowed to dry], the walls will be rendered solid, and not liable to cracks or other defects. When the stuff is well beaten and the under coats made solid, and afterwards well smoothed by the hardness and whiteness of the marble-powder, it throws out the colors mixed therein with great brilliancy. Colors, when used on damp stucco, are very durable." (Book VII, Chap. III.) When the Italian method has been described, it will be seen to differ from that of the ancients in two respects: —

(1) Marble-dust is used by the ancients for the finishing coats, where the Italians as a rule used sand, though not infrequently marble-dust was mixed with the sand by the latter.

(2) The ancient plaster is thicker and more compact, thereby retaining its humidity for a much longer period, and enabling the painter to continue his work for several days before the formation of the crust, after which all painting must cease.

THE PROCESS.

As these papers are addressed to the professional public, the technics of fresco will be summarily described. The method is too well known to call for an elaborate statement which any hand book of the art will furnish. A sketch, however, of the process is necessary, in order that architects and painters may judge of its adaptability to certain sites, and that comparisons may be instituted between it and other processes, with a view to modern mural undertakings. Principles will be emphasized rather than details, and the preliminary steps rather than the actual process of painting, for the latter is largely personal. It was my good fortune, a few years ago, to witness the execution of some frescos in the Campo Santo of Siena — that truly blessed spot with its monumental view over broad stretches of limitless clay-mounds, corrugated by the action of water, and backed by hazy Amiata and Santa Croce, and more distant Apennines. (No one of sensibility can ever recall those beloved, impressive Italian vistas without rhapsodizing.) Through the courtesy of Professor Franchi of the Sienese Academy of Fine Arts, I was enabled to try my hand at fresco, and to glean some practical information. Practice is so much more reliable and convincing than theory — the treatises not infrequently being written by mere compilers — that I shall give the preference to my own notes in the following statements, except, of course, when they are silent.

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[1] Continued from page 83, No. 530.

[2] Unfortunately, very little is really known about the reciprocal action of lime and sand. The table here appended, showing the effect of time on plaster, if correct, is interesting. It will be noticed that for the first fonr or five hundred years plaster gains in carbonate of lime, and that afterwards it loses in carbonate aud gains in silicate. At the end of two thousand years there is very little carbonate left. As a result, the plaster would be friable: —

COMPOSITION OF FRESH LIME MORTAR AND MORTAR HARDENED BY AGE.

From Wochenblatt f. Architekt. und Ingen. 1884; Töpfer und Ziegler Zeitung, 1884, 5, 206.

Components.	Fresh.	Age of the mortar in years.									
		1	30	100	200	300	600	1330	1800	2000	
Carbonate of calcium......	1.5 - 3.2	9-10.	13.	13.4	8-13.	14.	13.6	10. 0	6 - 7.	5	Parts by weight.
Hydrate of calcium.........	11.3 - 8.6	4 - 5.5	2.	1.4	0.4 - 1.0	0.7	0.4	—	—	—	
Lime combined with silicic acid.........	—	—	0.15	0.3	0.6 - 1 2	2.0	2.7	9. 0	14-16.	20	
Soluble silicates.........	—	—	0.35	0.5	1 - 2.	3.5	3.3	2. 5	1 - 1.5	—	
Oxide of iron and soluble alumina	0.6- 1.2	0.90- 1.2	1.10	0.6	0.4 - 0.6	0.5	0.7				
Alumina	0.1- 0.8	0.95- 1.0	0.55	0.7	0.1 - 0.6	0.7	0.3	2. 0	2.	4	
Sand, gypsum, magnesia, etc	85.5-86.2	82 - 84.	82-83	81.8	81.4-88.	78.5	79.	75. 5	75.	70	

The carbonate is formed first, then the silicate.

More will be said on the combination of sand with lime, as compared with the mixture of lime and other ingredients, at the close of the eighth paper, which treats of Byzantine fresco.

The Wall.—It is unnecessary to repeat what has been written at some length in a previous paper about the construction of the walls and their protection from damp. But there are a few rules of special applicability to fresco. Walls of well-dried and equally hard brick are the best. Rough stone walls are not objectionable. The plaster is liable to peel from smooth stone. Lathing is inferior to brick for perpendicular surfaces. Being exposed to the air on both sides, the plaster dries too rapidly, one of the requisites being that it should retain its moisture long enough to enable the painter to complete his allotted task. A wall of one or two bricks in thickness is preferable to a very thick one; for the latter remaining damp for a longer period, is more liable to saline efflorescence, the damp carrying the particles composing the salt to the surface. But whether thick or thin, brick or stone, the wall must be dry. A double wall with an air-space between is obviously the best. In Pompeii the painted walls were sometimes constructed of tiles placed edgewise and fastened to the outer wall by leaden clamps with a narrow space between, as a safeguard against damp. If there is any old plaster on the wall to be frescoed, it should be entirely removed, and the material of the wall laid bare. Lathing was used both in ancient and Renaissance times for ceilings, except when these were vaulted with brick. But the lathing then was much more durable than now, as has already been explained, and frequently was plastered above as well as below, thus protecting the paintings from dirt and moisture, and by retaining the humidity for a longer period enabled the frescoer to work more leisurely. Where the lathing was inferior, the frescos have paid the penalty, as, for example, those on the ceiling of the Loggie in the Vatican painted by Giovanni da Udine. With all our modern appliances, architects could undoubtedly construct a ceiling fulfilling all the conditions imposed by fresco, without having recourse to the lathing makeshift. If concrete blocks are used, they must not be too porous.

(*a*) *The Lime.* — A limestone free from foreign ingredients yields the best lime for fresco. After the lime has been well mixed with water till it has attained the consistency of cream, it is poured into earthen pits and kept there for at least a year, the longer the better. If too fresh, it will blister and flake off. Lime kept in this way is said to improve in consistence, and to grow milder or less caustic. It is hardly possible, however, that it should grow less caustic, for it is not exposed to the air. Though it is difficult to say why it improves by keeping, the fact that it does improve is attested by long experience — the best authority. Time alone is the true test, and though we may approximate its action by ingenious experiments, we can never exactly counterfeit it.[1] A certain amount of causticity is indispensable; otherwise the lime would lose its adhesiveness, the crust fail to form, and fresco be impossible. On the other hand, excessive causticity is to be avoided, for the crust would form too rapidly, before the painter could complete his work. Lime remains caustic till it has gained its maximum of carbonic acid, which it attracts from the atmosphere while drying. But the causticity cannot be reduced by exposing it to the air for any length of time, as it would become too hard for handling. Yet wet lime can be rendered less caustic in several ways without losing its requisite causticity. One of these ways, often recommended by the old masters, is to wash it frequently in river or spring water containing carbonic acid.

(*b*) *The Plaster.*—The lime is taken out of the pit, again mixed with water till it is about as thick as milk, well strained, and the superfluous water, which rises to the surface, poured off. It has then the consistence of cream cheese, and is ready to be mixed with the sand. This must be river sand well washed and passed through a sieve. No hair is to be used. Two plasterings are necessary for fresco:—

(1) The *arriccio*, or *arricciatura*, or "rough-cast."

(2) The *intonaco*, or *intonacatura*, or "*scialbo*," or finishing coat.

The proportion of sand to lime varies according to the richness of the lime. In Siena the rule was one part sand to one part lime, with rather more sand for the *arriccio*. Some authorities recommend two parts sand to one of lime. A good practical test for the *arriccio* is to spread the plaster on a dry, absorbing brick. If the plaster be good, little short cracks will appear. If deep, long cracks are developed, the plaster is too fat (*grasso*); in other words, there is too much lime. If no cracks make their appearance it is too poor (*magro*), too much sand. The *arriccio* should be a little less than half an inch in thickness, and applied in two or three quickly succeeding coats. Its surface should be roughened, to give a key to the *intonaco*. When it is thoroughly dry and hard, it is ready for the *intonaco*, on which the fresco is to be painted. After the *arriccio* has been saturated with water, the *intonaco* is spread in two thin coats, the whole being about one-tenth of an inch thick. Some painters mix marble-dust with the plaster for the *intonaco*, and occasionally color, to reduce its whiteness to a middle tint. The plaster is spread with a trowel or wooden float. At Siena they used both, but finished with the trowel. If the plaster be rubbed too hard, black spots injurious to the painting will appear. The surface should be so hard "as with difficulty to receive the impression of the finger." If texture be desired, it should be rubbed with a cloth, brush or the like. It sometimes happens that the plaster becomes too dry while polishing it with the trowel. In that case wet both plaster and trowel.

(*c*) *The Cartoon and Outline.* — All that has been said regarding the importance of a well-prepared cartoon for wax-painting is equally applicable to fresco. When the picture is so small that it can be painted in a single day, it may be transferred directly from the cartoon to the *intonaco*, or finishing coat. If the picture be large, it is better to transfer the whole cartoon by pouncing to the *arriccio*, before any of the *intonaco* is laid. Sometimes it is difficult to handle a large cartoon in awkward places; then the picture may be drawn on the *arriccio* with charcoal, being enlarged by the squaring process from the sketch, just as the cartoon would be. It is not absolutely necessary to transfer the whole picture to the *arriccio*, for one can work piecemeal on the *intonaco;* but it is obviously a safer method. The stereopticon might be used for the transfer of the sketch to the *arriccio*, were the conditions favorable to its use, but not for the subsequent outlining on the *intonaco*. The portion to be painted in one day having been indicated by the painter, the mason prepares it with the *intonaco*, as previously described. The corresponding portion of the cartoon is cut off (or a tracing is made of it, if it be desirable to keep the cartoon), and transferred to the wet *intonaco*, either by pouncing or by passing over the outlines with a style which leaves a corresponding depression in the plaster. For delicate works pouncing is preferable. Wilson, who closely inspected the frescos of the Sistine vault on a movable scaffold, says that Michael Angelo used the pounce-bag, but frequently accentuated the less delicate lines with some sharp instrument, after the cartoon had been removed.

(*d*) *Brushes.*—These should be of bristle, rather long and supple. If short and unyielding, they rub up the plaster. Those used at Siena were round, and very ordinary compared with the best French or English brushes. Marten or sable brushes were avoided chiefly on the ground of expense, though the work was beautifully finished. Marten's hair or otter's is said to resist the action of lime better than sable's.

(*e*) *Palette.*—This should be of tin, with a rim round it, to prevent the colors from running off, and a cup in the middle for pure water, which is the medium for fresco. At Sienna the palette was a large wooden slab, so propped as to be stable and handy.

(*f*) *Colors.*—Those that are fit for fresco have been fully catalogued at various times and by various authors. The differing nomenclatures are somewhat confusing. As a general rule it may be said that all the earth and a few mineral colors can be used, but neither animal nor vegetable colors. Here is a simple palette: —

Lime white ("*bianco Sangiovanni*").
Yellow ochre, Naples yellow.
Earth reds: Venetian red, light red, burnt Sienna and the like.
Terre verte, chrome green.
Raw and burnt umber.
Earth black is the best. Ivory black is too oily for fresco.
Cobalt blue, indigo, and pure or imitated ultramarine.
Burnt vitriol (purple).[2]

Vermilion may be rendered fit for fresco by placing it in a glazed earthenware vase and pouring lime-water on it. Afterwards the water should be poured off, and the operation repeated several times.

The white may be prepared in many ways. Cennini's method is elaborate but reliable. "Take very fine white slacked lime [from the pit] and put it into a little tub for the space of eight days, changing the water every day, and mixing the lime and water well together, in order to extract from it all unctuous properties. Then make it into small cakes, put them upon the roof of the house in the sun, and the older the cakes are, the whiter they become. If you wish to hasten the process and have the white very good, when the cakes are dry, grind them on your slab with water, and then make them again into cakes and dry them as before. Do this twice, and you will see how perfectly white they will become. This white must be ground thoroughly with water." Pozzo curtails this process considerably. The idea is to get rid of the caustic qualities of the lime; for this being a pigment with which all the others are more or less mixed, it would increase the already sufficient causticity of the *intonaco*.

It will be noticed that the palette for fresco is a quiet one, which, in a measure, accounts for its harmonious tones. The colors, when dry, appear lighter and warmer than when first applied to the cool, gray plaster, that ultimately dries white. To judge of their final effect the painter tries the colors on a piece of dry umber, which immediately absorbs their moisture.[3] It is well to prepare the whole of a needed tone at once. It is difficult to match tones in fresco. Warm colors are said to be more durable than cool, which is almost tantamount to saying that the earth colors are the safest.

(*g*) *Painting.* — It would be as vain and misleading to give a receipt for fresco as for oil or water-color painting. For amateurs such receipts are not without value. Every professional painter has his idiosyncracies and a handling that harmonizes with them. There are before me five receipts for painting a head in fresco, differing widely in details, but corresponding in essentials — which are worth signalizing. Fresco has not the depth of varnished oils, but a blonde, dead quality, that is the desideratum in mural painting. It is a cross

[1] Perhaps the best reason for keeping the lime in pits is given by Vitruvius: "Stucco will be well executed if lime of the best quality be slaked long before it is wanted; in order that if any portion was imperfectly burned in the kiln, the action of moisture in long maceration might slake it, and reduce it to the same consistence as the rest. For if lime be used too fresh, instead of being thoroughly macerated, it will, when spread (on walls), throw out blisters, owing to the crude particles that lurk in it. These particles, not having been duly slaked, swell and destroy the smoothness of the plaster." Prof. T. M. Clark tells me that his experience corroborates this view.

[2] Some authors recommend the addition of size to colors that do not mix freely with water.

[3] Dry, white absorbent wood is also recommended.

between distemper and water-color — semi-transparent and semi-opaque — not so clear as water-color, nor so heavy and lifeless as distemper. Consequently, the execution savors of both media — here a wash and there *impasto*. There are two schools of fresco; the one characterized by its comparatively thin, transparent qualities, and the moderate use of *impasto*, the other by a more generous use of it. To the former school belong all the earlier painters, from Cimabue to Raphael and Michael Angelo inclusive. Theirs are the methods recommended by Cennino Cennini. The other school came later, and is championed by Andrea Pozzo, Jesuit father, painter, architect and author (1642–1709.) The modern Siennese still prefer the delicate, refined manner of Cennino, while many others adopt the vigorous handling of Pozzo. The latter is more in harmony with our modern oil methods.

The following notes, many of which were jotted down on the staging, may be of service. (1) To avoid injury (from plastering) to the parts already painted, begin at the top of the picture and paint downwards. (2) Keep at hand a plentiful supply of pure water. (3) Draw in the subject with a dark tone, and indicate the shadows. (4) Begin with light, transparent washes, applied with a broad brush, and finish with impasto. (5) Better warmer washes over cool, and strong over weak. (6) The first washes appear very faint, but the painting acquires strength and consistence as it advances. Just before completion the water is rapidly absorbed from the brush as soon as it touches the wall, which means that the work must cease. Were it continued no crust would be formed, and chalky spots would make their appearance on the painting when dry.[1] (7) The setting of the plaster may be retarded in hot weather by sprinkling it with water. If there be danger of freezing, wait till milder weather. (8) Colors may be partially removed by washing, but it is better to avoid the necessity. (9) Those who so wish, may apply a final glaze over the damp colors, but it must be done rapidly and lightly. (10) During the work it may be necessary to pause at intervals to allow the moisture to be absorbed. (11) When the day's task is completed the mason cuts away the unpainted plaster with a sharp instrument and bevels the edge. It is needless to observe that the mason must be an adept. When painting a figure, it is well to paint a portion of the background at the same time, to avoid hardness of contour and preserve the integrity of the outline. On the following day the mason joins the fresh *intonaco* to that of the preceding day, and so on till the picture is completed. Heads should be finished at a sitting, and nude figures joined at a convenient line suggested by the anatomy. Wilson says that Michael Angelo painted his figures on the Sistine Vault in about three days each,[2] and indicates with a dotted line on a tracing from two of three the successive divisions. One of these figures is the Adam — about ten feet in height. I give here a similar tracing from Braun's photograph of one of the young men on the cornice. The dotted lines are suppositious in one or two places, but elsewhere the photograph indicates the divisions very clearly, notably about the head. (12) All retouches must be made with color, tempered with size, that is, "*a secco*" (dry), or when the plaster is no longer wet. A good size may be made of two parts water to one part of yolk-of-egg, mixed with a little vinegar to preserve it. Caseine mixed with water and quicklime is said to be an insoluble size. This size is too yellow for the blues. Parchment or fish glue is also used. "Secco" is perishable, and the less of it the better. Notwithstanding the example of some of the best frescoers, it is almost universally condemned, except for slight retouches.[3] When a considerable part of the work is unsatisfactory it must be destroyed and repainted.

Andrea Pozzo, the representative of the impasto school recommends a rough ground. But if the painting, he observes, be near the eye and should appear too rough, a sheet of paper must be placed over it, and the protuberances gently rubbed down with a trowel. Here is a quotation from him that reminds one strongly of modern ways: "For uniting tones, soft brushes must be used, though of hog's bristles, and not very moist; and occasionally, too, *the fingers* give good effects in the heads, hands, and other small things, particularly when the lime begins to set." FREDERIC CROWNINSHIELD.

[To be continued.]

AN ATONEMENT FOR THE RING THEATRE DISASTER.— The Emperor has opened an "Atonement House" on the site of the Ring Theatre, the burning of which a few years ago was attended with such terrible loss of life. The house is a handsome Gothic structure and will be let out in flats, the rents from which will be devoted to charitable purposes.

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[1] The Munich artists invented a contrivance for retarding the drying of the work, which enabled them to leave it for several hours and then take it up again. "They have a board of sufficient surface to cover that part of their work, and this is padded on one side, this cushion being then covered with waxed cloth; a wet piece of fine linen is then spread over the fresh plaster and painting, and then pressed to the surface of the wall by the cushioned side of the board, while the outer side is buttressed firmly by a pole from the ground.— *W. B. Sarsfield Taylor*. (References made to Cornelius Kaulbach and others.)

[2] Later, in the Last Judgment, he painted more rapidly, generally finishing a colossal figure in two days, "though," says Wilson, "he could execute an entire figure in one day."

[3] "He who can finish 'a *buon fresco*' will always be the best painter, and his work far more lasting; but seeing that lime always undergoes some change, especially in the shadows, one can, and ought, to retouch either with delicate strokes of pastel prepared from egg-shell, or with brushes half dry and charged with the requisite color. If such retouches are made in uncovered places, they are made in vain, for the first rain will carry them off." (Andrea Pozzo, Prospettiva dè Pittori, etc. P.II. S. XI. Roma, 1758.

COMMUNICATIONS

BOARDS OF PUBLIC WORKS.

NEW ORLEANS, February 11, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— There is a movement on foot here to form a Board of Public Works with the more immediate view of directing the drainage and sewerage. I am on a general committee to prepare a plan for organizing said Board, and would be thankful for such information as you may be able to furnish as to what other cities have similar bodies, especially independent of politics, so that correspondence may be opened with some of them, at least for precedents. An early answer will oblige, Yours, etc., JAMES FRERET.

[CINCINNATI, Ohio, and Ottawa, Canada, are the only cities we call to mind which have Boards of Public Works, but we will not go so far as to say that either city can boast such a *rara avis* as a Board — which must be endowed with considerable power "— independent of politics." We trust the publication of this letter will bring to light so phenomenal a body of men.— EDS. AMERICAN ARCHITECT.]

CHIP-CRACKING.

ROCHESTER, N. Y.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— We are troubled in this locality with "popping out" of plastering after the hard finish has been done. This phenomenon will not make its appearance sometimes until after a lapse of several months from the completion of a job, and then continue until the wall is fairly honey-combed. I should be pleased to hear from you gentlemen, through the *American Architect*, about this matter, and would feel greatly favored if you would give it due notice somewhere in your valuable paper. Yours truly, F. A. B.

[THE "popping out" of which our correspondent complains is due to the presence of under-burned nodules of lime which did not have time to slack before the plaster was applied to the walls. These nodules were thus imprisoned within the properly-tempered plaster as it hardened, which, however, being porous, did not prevent the penetration of moist air and the eventual slacking of the under-burned particles; the slacking, of course, caused expansion and the throwing off of the particles of plaster in front of it. There is no cure.— EDS. AMERICAN ARCHITECT.]

VENTILATION OF SCHOOL-HOUSES.

BOSTON, February 13, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— In a paragraph following my communication on "City Architects," in this week's issue of your paper, you state, "if, as *Experience* says, the last change in the office of the City Architect has brought a great advantage to Boston in enabling it to secure about *one-half* the supply of fresh air that an unofficial architect would deem necessary." . . .

This implies that the supply of air in the later Boston schools, fifteen to twenty-five cubic feet per scholar per minute, is only about one-half what architects would deem necessary, and supposably what they would provide, although the two are altogether different. Now, I deem it simply justice to myself, and to Mr. Vinal, the present City Architect of Boston, to show that the air-supply in the last five brick school-houses completed for the city is at least *four times* as much as the supply which architects have actually provided in the majority of school-houses east of, and including, New York State, and that it comes as near the standard desired as in any schools in this country.

I will consider the last point first. Dr. Billings, one of the best authorities on ventilation in this country, fixes as his standard for air supply in schools (see page 164 of "*Ventilation and Heating*"), not less than thirty cubic feet of fresh air per minute per scholar."

Mr. George W. Rafter, C. E., was employed in 1877 by the Board of Health of the city of Rochester, New York, to make an examination of the ventilation of the schools in that city, and, after making a thorough study of the subject, made out a table of the amount of air which should be supplied to scholars of different grades, which increases from fourteen feet per minute for the ninth grade to thirty-three feet per minute for the first grade.

Mr. Arthur Walworth, of the Walworth Manufacturing Company, states that the largest amount of air per minute which they ever figured upon, in computing their heating-plants for school-houses, is twenty feet, and that in reality the supply of air rarely reaches ten or twelve feet per minute. This much for *standards*. Now for the amount of air actually supplied in school-houses.

Dr. Billings commences his chapter on *Schools* with the following paragraph: "Of all classes of buildings in the United States, public or private, there are probably none which are in such an unsatisfactory condition as regards their ventilation as the public schools." Farther on he says: "Within a few years there has been a change for the better, but I am compelled to believe that the majority of architects in this matter go by rule of thumb instead of a satisfactory comprehension of the very simple principles involved, and that, moreover, the thumb aforesaid is not of the right dimensions or proportions."

One of the best ventilated of the Boston schools, built previous to 1884, is the Lowell school, where the ventilation was tested one day last fall in the presence of experts, and the supply of air found to be

five feet per minute per scholar, and in the opinion of the manager of the New York Exhaust and Ventilator Company, the ventilation in this school is as good as that in the average schools throughout the Eastern States, and very much better than in the New York City schools. On the same day the supply of air at the Parker Street school (both schools being in session), was twenty-five cubic feet per minute, or *five times* that in the older school. If you will read the report of Dr. D. F. Lincoln to the State Board of Health in 1884, of hist inquiry into the sanitary condition of schools in Massachusetts, you can see what kind of ventilation is provided in schools designed by unofficial architects. As near as the writer can ascertain the Boston schools are the only ones in the country ventilated by means of a fan, run all the time at a constant speed, with the single exception of one school in Chicago, in which a fan has recently been placed.

Any system which depends only upon the difference in density of the air in the room, and of the exterior air at the top of the building to produce the necessary current cannot work satisfactorily at all seasons of the year, especially in weather when the external temperature is between fifty and sixty.

Credit is especially due Mr. Vinal for the radical step he has taken in the matter of ventilation, from the fact that he made the innovation almost wholly on his own responsibility, and in face of unfavorable circumstances from certain members of the School Board, who have since, however, been obliged to admit the efficiency of the system.

The only New England school-house outside of Boston that has come to the notice of the writer in which the matter of ventilation has been scientifically considered, is a high-school-house in Bridgeport, Connecticut, Mr. W. R. Briggs, architect, and of which a description of the ventilation and heating was published in the Third Annual Report of the Connecticut State Board of Health.

Mr. Briggs deserves much credit for the method of heating and ventilation adopted, and the results seem to show an efficiency in cold weather about equal to that obtained by means of a fan.

It seems to me that architects cannot afford to belittle the profession by depriving each other of the credit due them.

Experience.

[We do not doubt the excellence of Mr. Vinal's provision for ventilating the Boston school-houses; but "Experience's" inference from this that the City of Boston has succeeded in securing an official architect who surpasses the rest of his profession in his knowledge of the subject does not seem to us justified. We are quite aware that the average American school-house presents a pretty low type of design and construction; but "Experience" must know that very few school-houses are designed by architects of real skill and reputation, and that still fewer are allowed by the authorities who control them to be built with anything like the provisions for ventilation and sanitation that their designers would like to introduce in them. Probably Mr. Vinal would prefer, if he thought he could bring the minds of his official superiors to his views, to supply fifty cubic feet of air per head per minute to his school-children instead of twenty-five, but he knows, as do many other architects, that it would be useless even to suggest such extravagance to a School-Board, and he contents himself with doing the best he can, which is certainly very good, but no more, as we believe, than scores of other architects could and would do under the same circumstances.

If we remember rightly "Experience" thinks that an official architect, in his anxiety to surpass the fame of his predecessor, is likely to be eager to learn of all examples and suggestions for improving upon the plans which have been handed down in his office. Mr. Vinal's administration of his post, seems, indeed, to indicate that he has been guided by some such salutary ambition; and if, as "Experience" thinks the only New England school-house known to him outside of Boston in which the matter of ventilation has been scientifically considered, is Mr. Briggs's Bridgeport High School, we regret that he has not earlier applied to us for information. To say nothing of Mr. Richardson's Worcester High School, we could have told him of a school-house, built about twenty years ago, within ten miles of Boston, in the plan of which a most thorough system of ventilation by a fan formed an important part; and we should, if we had been applied to have warned him, by the example of this fan, which has long been idle, that ventilation depending upon the use of expensive motors, over which a janitor or an ignorant or parsimonious committee can get control, soon comes to be regarded as an extravagant freak of the architect, the effect of which it is most prudent and business-like men to counteract quietly by the simple process of stopping the fan.— Eds. American Architect.]

EXTERNAL PLASTERING.

Sayville, N. Y., February 11, 1886.

To the Editors of the American Architect: —

Dear Sirs,— In looking over the advertisers' supplement to last week's issue of your journal, I notice that the Stanley Fire-Proof Lathing Company recommends the use of their goods for holding plaster on the external walls of frame-buildings. Can you inform me what kind of mortar experience has shown to be the best and most enduring for this class of work? I would like to know whether lime or cement mortar is best, or a combination of the two, and if cement is recommended, whether Portland or Rosendale is best? I would also ask whether this sort of covering may be considered as reasonably lasting without being painted? If you can favor me with replies to the above queries without too great a sacrifice of your valuable time, you will confer a favor on a subscriber.

Yours respectfully, I. H. Green, Jr.

[Lime-mortar, with a little admixture of Rosendale cement, is generally used on wire-lath, and stands very well, particularly where a little sheltered, as by an overhanging gable or eaves. There is no need of painting it, but a certain amount of protection against washing is obtained by the "pebble-dash" of thin lime and pebbles, which is often thrown over it. — Eds. American Architect.]

NOTES AND CLIPPINGS

January Fire-Loss. — The New York *Daily Commercial Bulletin* of February 5 estimates the January fire-loss of the United States and Canada at $12,000,000, which is $2,000,000 more than the average January loss in the past ten years.

The Tariff on Art Again. — The department has declined to allow the free entry of a painting by a foreign artist residing in Boston, for exhibition in his own studio, as not within the scope of the provisions of *Section* 2, 308, P. S., for the admission free of duty of paintings imported for exhibition by an association.

A Modern Samson. — Beyond the abbey at Quimperle, Brittany, is the retired Basilica of the Holy Cross, where lie the bones of St. Gurlaës, a ninth-century saint and martyr, to whom all true Bretons burn a candle in cases of sickness. Built in the eleventh century on the plan of the church of the Holy Sepulchre (the crypt of that date still exists), its condition in 1862 led to the commencement of some very necessary repairs. The intelligent architects entrusted with the work had various crumbling stones in the pediments of the four great groups of columns supporting the dome removed, intending to replace them by new ones; but their lofty minds overlooked the necessity of temporarily shoring up the pillars. One day the workmen observed certain threatening symptoms in the vault above them, and they left the church *en masse*. At the door they met an inquisitive citizen, who wished to inspect the work. They warned him of imminent danger; he stalked by them majestically, and gaining the centre of the church, remarked: "Danger! this building will last until the day of judgment!" Hardly were the words out of his mouth, when the whole edifice fell in with a terrible crash, crushing the luckless prophet to pieces. No one else was hurt. And the moral of this is —— ? — *Correspondence of New York Commercial Advertiser.*

TRADE SURVEYS

Architects are busy on estimates and preliminary drawings in nearly all the larger cities, and send reports of a very gratifying character concerning business prospects. The labor agitations for higher wages and "shorter hours" seem to be increasing and gaining in strength. The agitations in this city, conducted mainly under the auspices of the Knights of Labor, are gathering all kinds of skilled laborers into organization. One motive which leads the thousands into unions is to secure the establishment of an eight-hour, or at least, a nine-hour day. The desire for leisure as intelligence increases, is a natural one. In several other New England cities the movement has taken deep root. The building trades will lead the movement, should a movement become necessary. Employers have, in many cases, already come to terms with their workmen. Estimates and bids have been and are being made in most cases to cover the probability of a shorter labor day. The next movement, after creating an artificial scarcity of labor, will, of course, be to increase the price of labor; but the attempt will not be made this year unless phenominal and altogether improbable activity developes itself in building, railroad construction and manufacturing. Employers in several industries have been meeting and conferring concerning the unusual conditions. The permanency of the present labor movement is a point considered. Labor leaders themselves doubt the durability of their organizations because of the tendency to break away under disappointments. Arbitration has been patiently considered. Employers who look closely into it see behind it the edict of trades-unionism, see in it only the reflection of organized labor, and therefore do not so quickly accept it as theorists and sentimentalists. Arbitration, they say, in the hands of a compact labor organization, is simply another term for compulsion. It takes the rough edge off and graciously permits the employer of labor to say "yes" to a demand. The radical defect with arbitration as proposed by organized labor and its outside friends and advocates is, our employers say, that it ignores competition and elevates other hazy factors into its place, such as, for instance, the factor of fair, living wages. It is not by any means intended in this Trade Survey to enter on a discussion of the case, but merely to state the case fairly. Employers cannot know, they say, where they stand, if competition as a factor in the determination of the value of services is set aside, and humanitarian considerations introduced in its place. But the new ideas are being pushed with force, and whether employers like them or not they cannot be thrust aside. Labor's objective point for years has been to gain a position where it would be able to say "I will, I will not." The most compact union in America, viz., the Amalgamated Association of Iron and Steel Workers will not arbitrate in the sense arbitration is understood, because, as it says, "We have the power to enforce our decrees — why arbitrate and take less." Not half that is apprehended from compact labor organization will be encountered. The giant is gentle. The building trades are everywhere preparing for great activity. Builders are however somewhat slow to place their orders for material and supplies. Railroad freight rates may change. The railroad managers have not yet agreed whether to fight or unite. Lumbermen are waiting, so are iron and steel makers. Combinations and pools are proposed, but all contain elements of weakness. The industries are waiting to know what percentage of cost must go for transportation of products. The material-men are everywhere busy, knowing that their supplies sooner or later will be called for. Money is abundant for all kinds of legitimate enterprises, and is seeking employment earnestly. The risks are at a minimum. Profits on building investments are large. The country demands better and more expensive housing and will pay for it. The architects vie with each other in showing how to build a $7,000 house for $5,000, in the completeness of its appointments.

The tendency toward trade combination is still very marked. The Connelsville coal strike is over. The bituminous operators and miners of the Western States are in conference this week at Columbus. The nailers are still determined. Eastern iron workers are asking for higher wages. Textile workers in several centres have secured further advances in wages. Distributors of manufactured products report no more than a moderate demand, evidently believing that the present enormous production is more likely to work prices downwards than upwards.

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HELIOTYPE PRINTING CO. BOSTON.

THE MONTALBANS—TOREN,

AMSTERDAM, HOLLAND.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX | Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. | No. 532.

MARCH 6, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

WE are always glad to see any indications that the irresistible influence of the insurance companies is becoming enlisted in support of improved methods of building construction. The last manifestation of the kind which has come under our notice is in the form of a little circular issued by the Home Insurance Company of New York, and containing suggestions in regard to the proper construction of chimneys, and the care of lamps, matches, stoves and furnaces which are excellent so far as they go, and could, as we think, be with great advantage expanded by coöperation of the companies represented in the National Board of Underwriters, into a small manual, which could be placed in the hands of every householder in the United States for less than the cost of one serious city fire, and would be highly valued in nearly all families. Such a manual, if written for householders, not, like the circular before us, mainly for agents, would call the attention of the owners to myriads of defective flues and unsafe matchboxes, and as there are very few persons who do not wish to avoid being burned alive, however heavily their houses may be insured, it would be strange if the conditions exposing families to that risk, if pointed out, were not in most cases promptly remedied, to the great advantage of the insurance companies, as well as of the householders themselves, even though they happen to be "fully insured."

TAKING up the circular of the Home Company, while we find some excellent suggestions, we cannot avoid comparing the smallness of their number with the multitudes of the equally important ones which suggest themselves to us as we read; and in some cases we discover points which the importance of reliability in such documents makes it, perhaps, advisable to criticise. The first paragraph relating to construction is, very properly, devoted to "Defective Flues," and begins by saying that all chimneys and flues should be built of good, sound brick, with "double walls," whatever that may mean, continuing, with the excellent, but rather impracticable suggestion that the chimneys, when completed, should be "allowed to settle firmly before being enclosed within a wooden structure." "When this important point is overlooked," it goes on to say, "the mass of the chimney-stack will settle and draw away from that part supported by the roof timbers, and thus leave a dangerous opening at an unfrequented spot." It would be interesting to know how the insurance companies would propose to allow chimneys to "settle firmly" before putting the roof on the building to which the chimneys are attached, and we would suggest modifying the sentence in such a way as rather to point out the disadvantages of designing chimneys with projecting bases, which are, indeed, often caught on the roof timbers as the chimney settles, and lifted away from the brickwork beneath, together with the necessity for building chimneys vertical, and leaving a clear space of one-inch, not two-inches, as the circular elsewhere proposes, around them everywhere, except where the flexible trimmer-arches are turned between them and the floor-beams.

THE rest of the first paragraph regarding chimneys is devoted to the vexed subject of pargeting flues, and directs that the inside of flues should be pointed only, "this class of finish," it says, "being better and safer than the usual method of plastering the inside of a flue, as under the influence of the changes from heat to cold the plaster is liable to drop off, and carry with it a share of the mortar, thus leaving a weak spot." We know that this view of the matter is the one which prevails in New York, where the Home Insurance Company's office is situated, but it seems to us that a sweeping application of the theory to all parts of the country is injudicious, to say the least. It must not be forgotten that in New York cement is cheap, and its use in buildings, either with or without lime, is almost universal, while in the poorest and cheapest buildings, where the use of cement is avoided, on account of the expense, "ground lime," of a somewhat hydraulic quality, is commonly used in place of the purer kinds. Joints well-filled with mortar made of such materials, and properly pointed, have a considerable power of resistance to the action of the hot and acid vapors of a flue, while joints made with the pure lime used in other parts of the country are often corroded completely through by the vapors in a few years. Where the purer limes are used in chimney-building, therefore, some protection to the joints against the chimney-vapors is necessary, and a pargeting coat of mortar, well put on, is as good and lasting a protection as can easily be obtained. The mortar should be spread while the bricks are still damp, and the joints soft, and should be smoothed and hardened by brushing with a wet whitewash-brush. When put on in this way it presents a surface over which the drops of condensed water and pyroligneous acid roll back to the bottom of the flue, without lodging, as they do, in the crevices formed by pointed joints, while the coating of soot and creosote, which forms on the surface, probably protects the lime, in some degree, from corrosion by the trickling drops. Although it is possible for scales of lime-mortar to become detached, and fall into the flue, this does not seem to occur so frequently in the places where pure lime is used as in New York, and the pargeting, which is there forbidden by law, on the grounds which the Home Insurance Company's circular adduces, is compulsory in Boston, and, we think, in other places where for various reasons cement is less commonly used than in New York.

WE pass over a few valuable hints in regard to the care of lamps and matches, and the disposition of oily rags, and come to some rules for setting stoves and furnaces, which seem to us open to criticism. Their worst fault is the uncertainty which seems to have existed in the mind of their author between the properties of woodwork and plastering. The first rule provides that "all woodwork or lath and plaster partitions within eighteen inches of stoves, or within ten inches of stove-pipes, should be protected with metal (tin or galvanized-iron preferred) with an air-space of one-half inch between the metal and the surface to be protected." Nearly every clause of this might, we think, be improved. To begin at the beginning, most architects know that a coat of plaster is so admirable a non-conductor that, even if a stove-pipe were in actual contact with it, there would be great difficulty in getting heat enough through it to kindle the laths behind it; and to put a plastered partition and wooden sheathing on an equality in regard to precautions against setting them on fire from a stove-pipe is injudicious, to say the least; and while woodwork of certain kinds, as, for instance, oiled pine, would be hardly safe if unprotected, within two feet of certain kinds of heating stoves, a plastered partition would, under the same circumstances, be safe within one foot. Again, as to the metal to be used for protection, and the method of applying it, we should be glad to see the rule

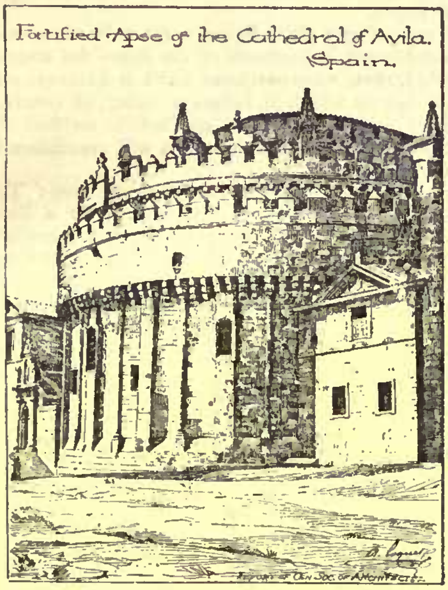
changed, It is hardly necessary to say that by far the best metal for protection is bright tin, meaning by this iron plates coated with pure tin, as distinguished from roofing tin-plate, which is coated with lead. Bright tin acts by reflecting the rays of heat from its silvery surface, and in this way defending the combustible woodwork beneath it. Its power of reflection depends upon its lustre, and diminishes with this until, if the surface is artificially blackened, it will absorb all, or nearly all the heat-rays falling upon it, and transmit them to the wood behind it. Housekeepers know that it is hard to get water to boil in a new tin teakettle, because the shining surface repels the rays radiated from the fire, and it is not until the tin gets discolored and blackened that it acquires its full efficiency as a household utensil; and for protecting surfaces of wood against radiated heat the brilliancy of the metal shield is very nearly the exact measure of its value. Whether the shield should be put directly upon the wood, or set at a little distance from it, depends, perhaps, on what the shield is composed of. Where black-iron is used, and perhaps also with old and tarnished zinc or galvanized-iron, there is little or no reflection of the heat rays from the surface, and the metal, instead of remaining cool, as bright tin does where exposed to radiant heat, becomes so hot that wood in contact with it would be little safer than if left without any protection, except so far as the obstruction of the air-supply might help to prevent it from taking fire. If, however, a screen of this kind is held at a little distance from the woodwork which it is designed to protect, and provision is made for the admission of air behind it, which, by the way, the rules do not mention, the heat absorbed by the screen sets up a movement of the air behind, and in contact with it, and this circulation is rapid enough to keep down the temperature of the woodwork on the other side of the cement. With bright tin, on the contrary, little or no heat is absorbed, and there is no need of a current of air to carry it off, and no tendency toward the production of one, so that with this material, the plates can be tacked directly to the woodwork with as good results as when held on a frame half-an-inch away from it, and at very much less expense.

SOME of the facts brought out in the course of the discussion upon the setting of wood on fire by steam-pipes, which occupies considerable space in several technical journals just now, point strongly to the desirability of instituting somewhere a connected series of experiments on the subject, the results of which should be made public for the general benefit. It is remarkable that several writers have recently mentioned, as the result of their experience, that woodwork near a leaky joint in a steam-pipe, or exposed to escaping vapor, has been charred, and even set on fire, while the much higher temperature of a perfect pipe, carrying steam under pressure, is always, so far as they know, borne with impunity by wood in contact with it. Running over in our mind, by the light of these observations, the examples which we recollect of fire set by steam-pipes, it strikes us, as it never did before, that watery vapor may have been present in all the instances, and may have played a part in exciting combustion, which has been hitherto unnoticed and unexplained. If it should be shown that the presence of moisture is necessary to the kindling or charring of wood subjected to a temperature of two hundred and twelve degrees, not only will the discordant assertions of those who do, and those who do not, believe that steam-pipes can set wood on fire be reconciled, but a very important advance will be made in the science of safe construction and protection against fire — and there are many indications that this is really the case. While there are thousands of examples of woodwork remaining for years with perfect safety in contact with high-pressure steam-boilers or pipes, perhaps half the examples of combustion excited by the heat of steam, show obviously that the moisture, as well as the heat of the vapor had something to do with the result; and in the other examples, so far as we know, there is nothing to show that the incendiary pipes may not have leaked, or that the woodwork consumed may not have been moist with water derived from some other source. With heat and moisture together, it is now pretty evident that wood may be charred at a comparatively low temperature. We can ourselves remember a case where the cover of a house hot-water tank, the thermometer in which would probably never rise to two hundred degrees, was found, after some years of use, to be deeply charred; and it may be fairly questioned, not only whether the heat of steam without water is capable of kindling wood, but whether moisture, with a comparatively feeble degree of warmth, may not be more dangerous than has been hitherto suspected.

A SINGULAR project for providing poor people with lodgings has been discussed in Paris. Some enterprising genius who has associated with himself some other persons of similar character, offers without assistance from the city or the general government, to spend fifty millions of dollars in purchasing land and erecting tenement-houses, all of which shall at the end of seventy-five years become the property of the city. The method by which it is intended to raise funds for this remarkable enterprise shows considerable financial ingenuity. Although the company asks no aid from the public treasury, it requests permission to issue bonds to the amount of fifty million dollars, secured by mortgage of its real estate; the bonds to be of the uniform denomination of one franc each, and to bear no interest, but to be redeemable at any time within the seventy-five years by lot; the drawings to be so arranged that every one-franc bond shall draw at least a minimum prize of two francs, and shall have the chance of drawing higher prizes, varying in value up to two hundred thousand francs, or forty thousand dollars. The drawings are to take place every three months; so that the capitalist who invests one franc in a bond to-day may make a profit of twenty million per cent in ninety days, and is certain to realize one hundred per cent profit some time within seventy-five years. Men are by nature so hopeful that this would probably seem a dazzling prospect to thousands of poor people whose little deposits in the savings-bank seems to them to grow very slowly; but any one with a taste for mathematics can easily see that even with the small returns yielded by Paris real-estate, the saving of interest on the bonds would enable the promoters to pay the prizes which they offer, and give them an enormous profit besides; and it is in fact estimated by the members of the company, who seems to be really philanthropists, not speculators, that they will be able to turn over to the municipality, at the end of the seventy-five years' term, not only the fifty million dollars worth of tenement-houses, but a cash surplus, after redeeming all the bonds at double the full value, and paying all the lottery prizes, amounting to at least fifty million dollars more.

THE American Society of Civil Engineers has appointed a committee consisting of Messrs. F. Collingwood and A. V. Abbott, Past-president D. J. Whittemore, Colonel Thomas Lincoln Casey, and Professor George F. Swain, to investigate the characteristics of cements, mortars, and concretes, with special reference to their changes in dimension under various conditions as to their component parts, their age, and the superposed loads, and incidentally with regard to their behavoir in freezing weather. In order to render their report, which will be of extreme importance to architects and builders, as comprehensive as possible, the committee requests information from all persons who can give, from their own experience or the well-authenticated experience of others, facts concerning the expansion or shrinkage of concrete or masonry made with particular cements or mortars, and concerning the successful laying of masonry in frosty weather, with descriptions of the methods pursued. Those who have the opportunity can easily make accurate measurements on masonry in progress of erection at successive periods, noting at each the character of the work, the materials used, the number and thickness of the joints, the quality and fineness of the sand and of the cement, the amount and distribution of the loads, and any other particulars, and last, but not least, the temperature at the time of measuring. In a high building, such, for instance, as a chimney, the expansion caused by the heat, either of the sun or of smoke within it, is very considerable, and unless the temperature and other circumstances are known it will be impossible to make the proper allowances for learning what effects are due to the properties of the cement or mortar alone. We know several architects and builders who could furnish the committee with valuable information, and trust that they will contribute from their knowledge to the general good. Those who have communications to make, or who wish for further particulars, should address, Mr. F. Collingwood, care American Society of Civil Engineers, 127 East Twenty-third street, New York city.

SAFE BUILDING.—I.



IN the articles on this subject the writer proposes to furnish to any earnest student the opportunity to acquire, so far as books will teach, the knowledge necessary to erect *safely* any building. While, of course, the work will be based strictly on the science of mechanics, all useless theory will be avoided. The object will be to make the articles simply practical. To follow any of the mathematical demonstrations, arithmetic and a rudimentary knowledge of algebra and plane geometry will be sufficient.

The following outline will probably give a better idea of the work proposed: —

First will come an introductory chapter on the "Strength of Materials." This chapter will give the values of, and explain briefly, the different terms used, such as strain, stress, factor of safety, centre of gravity, neutral axis, moment of inertia, centre and radius of gyration, moment of resistance, and moduli of elasticity and rupture.

Then will follow the several formulæ to be used, with explanations giving their application, viz.: compression in long and short columns; wrinkling strains and lateral flexure in top chords of girders and beams; tension and shearing strains; transverse strains, including rupture, deflection and bending moments in cantilevers and beams; parallelogram of forces and graphical method of calculating trusses and arches; also manner of obtaining amounts of loads. Accompanying the above will be the necessary tables used in calculations.

After this introductory chapter will follow a series of chapters, each dealing with some part of a building, giving practical advice and numerous examples of calculations of strength; for instance, chapters on foundations, walls and piers, columns, beams, riveted and other girders, cast-iron lintels, roof and other trusses, spires, masonry, inverted and floor-arches, corrugated-iron, stairs, sidewalks, chimneys, etc., and possibly also chapters on drainage, plumbing, heating and ventilating.

CHAPTER I.

STRENGTH OF MATERIALS.

(German, *Festigkeit;* French, *Résistance des matériaux.*)

ALL solid bodies or materials are made up of an infinite number of atoms, fibres or molecules. These adhere to each other and resist separation with more or less tenacity, varying in different materials. This tenacity or tendency of the fibres to resume their former relation to each other after the strain is removed is called the elasticity of the material. It is when this elasticity is overcome that the fibres separate, and the material breaks and gives way.

There are to be considered in calculating strengths of materials two kinds of forces, viz., the external (or applied) forces and the internal (or resisting) forces. The external forces are any kind of forces applied to a material and tending to disrupt or force the fibres apart. Thus a load lying apparently perfectly tranquil on a beam is really a very active force; for the earth is constantly attracting the load, which tends to force its way downwards by gravitation and push aside the fibres of the beam under it. These latter, however, resist separation from each other, and the amount of the elasticity of all these fibres being greater than the attraction of the earth, the load is unable to force its way downwards and remains apparently at rest.

The amount of this tendency to disrupt the fibres (produced by the external forces) at any point is called the "strain" at that point.

The amount of the resistance against disruption of the fibres at such point is called the "stress" at that point.

External (or applied) forces then, produce *strains.* Internal (or resisting) forces then produce *stresses.*

This difference must be well understood and constantly borne in mind, as strains and stresses are the opposing forces in the battle of all materials against their destruction.

When the strain at every point of the material just equals the stress, the material remains in equilibrium. The greatest stress, at any point of a material that it is capable of exerting is the ultimate stress (that is, the ultimate strength of resistance) at that point. Were the strain to exactly equal that ultimate stress, the material, though on the point of breaking, would still be safe theoretically. But it is impossible for us to calculate so closely. Besides we can never determine accurately the actual ultimate stress, for different pieces of the same material vary in practice very greatly, as has been often proved by experiment. Therefore the actual ultimate stress might be very much less than that calculated.

Again, it is impossible to calculate the exact strain that will always take place at a certain point; the applied forces or some other conditions might vary. Therefore, to provide for all possible emergencies, we must make our material strong enough to be surely safe; that is, we must calculate (allow) for a considerably greater ultimate stress at every point than there is ever likely to be strain at that point.

The amount of extra allowance of stress varies greatly, according to circumstances and material. The number of times that we calculate the ultimate stress to be greater than the strain is called the factor-of-safety (that is, the ratio between stress and strain).

If the elasticity of different pieces of a given material is practically uniform, and if we can calculate the strain very closely in a given case, and further, if this strain is not apt to ever vary greatly, or the material to decay or deteriorate, we can of course take a low or small factor-of-safety; that is, the ultimate stress need not exceed many times the probable greatest strain.

On the other hand, if the elasticity of different pieces of a given material is very apt to vary greatly, or if we cannot calculate the strain very closely, or if the strain is apt to vary greatly at times, or the material is apt to decay or to deteriorate, we must take a very high or large factor-of-safety, that is, the ultimate stress must exceed many times the probable greatest strain.

Factors-of-safety are entirely a matter of practice, experience, and circumstances. In general, we might use for stationary loads:

A factor of safety of 3 to 4 for wrought-iron and steel,
" " " 6 for cast-iron,
" " " 4 to 10 for wood,
" " " 10 for brick and stone.

For moving-loads, such as people dancing, machinery vibrating, dumping of heavy loads, etc., the factor-of-safety should be one-half larger, or if the shocks are often repeated and severe, at least double of the above amounts. Where the constants to be used in formulæ are of doubtful authority (as is the case with most of them for woods and stones), the factor-of-safety chosen should be the highest one.

In building-materials we meet with four kind of strains, and, of course, with the four corresponding stresses resisting them, viz.: —

STRAINS.

Compression, or crushing strains,
Tension, or pulling strains,
Shearing, or sliding strains, and
Transverse, or cross-breaking strains.

STRESSES.

The resistance to *Compression*, or crushing-stress,
The resistance to *Tension*, or pulling-stress,
The resistance to *Shearing*, or sliding-stress, and
The resistance to *Transverse* strains, or cross-breaking stress.

Materials yield to *Compression* in three different ways: —

1. By direct crushing or crumbling of the material, or
2. By gradual bending of the piece sideways and ultimate rupture, or
3. By buckling or wrinkling (corrugating) of the material lengthwise.

Materials yield to *Tension*,

1. By gradually elongating (stretching), thereby reducing the size of the cross-section, and then,
2. By direct tearing apart.

Materials yield to *Shearing* by the fibres sliding past each other in two different ways, either

1. Across the grain, or
2. Lengthwise of the grain.

Materials yield to *Transverse* strains,

1. By deflecting or bending down under the load, and (when this passes beyond the limit of elasticity),
2. By breaking across transversely.

In calculating strains and stresses, there are certain rules, expressions, and formulæ which it is necessary for the student to understand or know, and which will be here given without attempting elaborate explanations or proofs. For the sake of clearness and simplicity, it is essential that in *all* formulæ the same letters should *always* represent the same value or meaning; this will enable the student to *read* every formula off-hand, without the necessity of an explanatory key to each one. The writer has further made it a habit to express, in *all* cases, his formulæ in pounds and inches (never using tons or feet); this will frequently make the calculation a little more elaborate, but it will be found to greatly simplify the formulæ, and to make their *understanding* and *retention* more easy.

In the following articles, then, a capital letter, if it were used, would invariably express a quantity (respectively), either in tons or feet, while a small letter *invariably* expresses a quantity (respectively), either in pounds or inches.

The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.: —

a signifies *area*, in square inches.
b " *breadth*, in inches.
c " constant for *ultimate resistance to compression*, in pounds, per square inch.

d signifies *depth*, in inches.
e " constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f " *factor of safety*.
g " constant for *ultimate resistance to shearing*, per square inch, across the grain.
$g_{,}$ " constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h " *height*, in inches.
i " *moment of inertia*, in inches.
k " *ultimate modulus of rupture*, in pounds, per square inch.
l " *length*, in inches.
m " *moment* or *bending moment*, in pounds-inch.
n " *constant* in Rankine's formula for compression of long pillars.
o " the *centre*.
p " the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q " the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r " *moment of resistance*, in inches.
s " *strain*, in pounds.
t " constant for *ultimate resistance to tension*, in pounds, per square inch.
u " *uniform load*, in pounds.
v " *stress*, in pounds.
w " *load at centre*, in pounds.
x, *y*, and *z* signify *unknown quantities*, either in pounds or inches.
δ signifies *total deflection*, in inches.
ρ^2 " *square of the radius of gyration*, in inches.
$\mathfrak{D}$ " *diameter*, in inches.
$\mathfrak{r}$ " *radius*, in inches.
$\pi = 3.14159$, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with Roman numerals, as for instance, a, $a_{,}$, $a_{,,}$, $a_{,,,}$, etc., or b, $b_{,}$, $b_{,,}$, $b_{,,,}$, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as for instance: —

m signifies moment or bending moment at *centre*.
m_A " " " " *point A*.
m_B " " " " *point B*.
m_X " " " " *point X*.
s " strain at *centre*.
s_B " " *point B*.
s_X " " " *X*.
v " stress at *centre*.
v_D " " *point D*.
v_X " " *X*.
w signifies load at *centre*.
w_A " " " *point A*.

CENTRE OF GRAVITY.

(German, *Schwerpunkt;* French, *Centre de gravité*.)

The centre of gravity of a figure, or body, is that point upon which the figure, or body, will balance itself in whatever position the figure or body may be placed, provided no other force than gravity acts upon the figure or body.

To find the centre of gravity of a plane figure, find two neutral axes, in different directions, and their point of intersection will be the centre of gravity required.

NEUTRAL AXIS.

(German, *Neutrale Achse;* French, *Axe neutre*.)

The neutral axis of a body, or figure, is an imaginary line upon which the body, or figure, will always balance, provided the body, or figure, is acted on by no other force than gravity. The neutral axis always passes through the centre of gravity, and may run in any direction. In calculating transverse strains, the neutral axis designates an imaginary line of the body, or of the cross-section of the body, at which the forces of compression and tension meet. The strain on the fibres at the neutral axis is always naught. On the upper side of the neutral axis the fibres are compressed, while those on the lower side are elongated. The amount of compression or elongation of the fibres increases directly as their distance from the neutral axis; the greatest strain, therefore, being in the fibres along the upper and lower edges, these being farthest from the neutral axis, and therefore called the *extreme fibres*. It is necessary to calculate only the ultimate resistance of these extreme fibres, as, if they will stand the strain, certainly all the other fibres will, they all being nearer the neutral axis, and consequently less strained. Where the ultimate resistances to compression and tension of a material vary greatly, it is necessary to so design the cross-section of the body, that the "extreme fibres" (farthest edge) on the side offering the weakest resistance, shall be nearer to the neutral axis than the "extreme fibres" (farthest edge), on the side offering the greatest resistance, the distance of the "extreme fibres" from the neutral axis being on each side in direct proportion to their respective capacities for resistance. Thus, in cast-iron the resistance of the fibres to compression is about six times greater than their resistance to tension; we must therefore so design the cross-section that the distance of the neutral axis from the top-edge will be six-sevenths of the total depth, and its distance from the lower edge one-seventh of the total depth.

To find the neutral axis of any plane-figure, some writers recommend cutting, in stiff card-board, a duplicate of the figure (of which the neutral axis is sought), then to experiment until it balances on the edge of a knife, the line on which it balances being, of course, the neutral axis. This is an awkward and unscientific method of procedure, though there may be some cases where it will recommend itself as saving time and trouble.

The following general formula, however, covers every case: To find the neutral axis *M–N* in any desired direction, draw a line *X–Y* at random, but parallel to the desired direction. Divide the figure into any number of *simple* figures, of which the areas and centres of gravity can be readily found, then the distance of the neutral axis *M–N* from the line *X–Y* will be equal to the *sum* of the *products* of each of the small areas, multiplied by the distance of the centre of gravity of each area from *X–Y*, the whole to be divided by the entire area of the whole figure. An example will make this more clear.

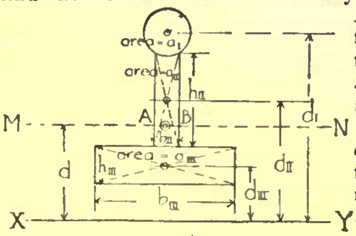


Fig. 1.

Find the horizontal neutral axis of the cross-section of a deck-beam, standing vertically on its bottom-flange.

Draw a line (*X–Y*) horizontally (Fig. 1), then let $d_{,}$, $d_{,,}$, $d_{,,,}$, represent the respective distances from *X–Y* of the centres of gravity of the small subdivided *simple* areas $a_{,}$, $a_{,,}$, $a_{,,,}$, then let a stand for the whole area of section, that is: —

$$a_{,} + a_{,,} + a_{,,,} = a,$$

then the required distance (d) of the neutral axis *M–N* from *X–Y*, will be

$$d = \frac{a_{,}\, d_{,} + a_{,,}\, d_{,,} + a_{,,,}\, d_{,,}}{a}.$$

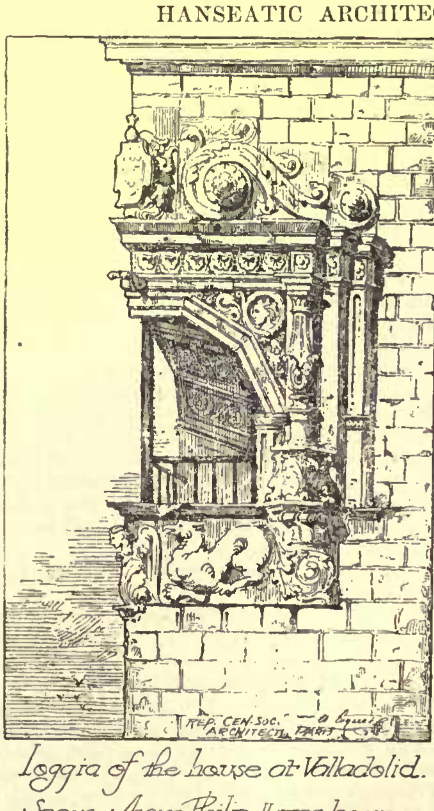
To find the centre of gravity of the figure, we might find another neutral axis, but in a different direction, the point of intersection of the two being the required centre of gravity. But as the figure is uniform, we readily see that the centre of gravity of the whole figure must be half-way between points *A* and *B*.

The centre of gravity of a circle is always its centre. The centre of gravity of a parallelogram is always the point of intersection of its two diagonals. The centre of gravity of a triangle is found by bi-secting two sides, and connecting these points each with its respective opposite apex of the triangle, the point of intersection of the two lines being the required centre of gravity, and which is always at a distance from each base equal to one-third of the respective height of the triangle. Any line drawn through either centre of gravity is a neutral axis.

L. D'C Berg.

[To be continued.]

HANSEATIC ARCHITECTURE.



Loggia of the house at Valladolid. Spain, where Philip II was born

In the beginning of the thirteenth century, at a time when commerce by sea was little more than outrageous piracy and commerce by land was obliged to follow one or two beaten tracks across Europe in order to escape the merciless exactions of the robber barons, a few growing towns of northwestern Germany, joined in a league for the protection of their feeble industries, and endeavored to secure to themselves alike freedom of trade and commercial independence of the swarms of petty rulers who claimed jurisdiction over the country and made the collection of customs duties a pretext for the most burdensome taxation. At that time Germany had no position as a commercial nation. Nearly all of the trade with the Mediterranean and the East was in the hands of the Genoese and the Venetians. The borders of the Baltic were occupied by half-wild Slavic tribes, while its waters were never

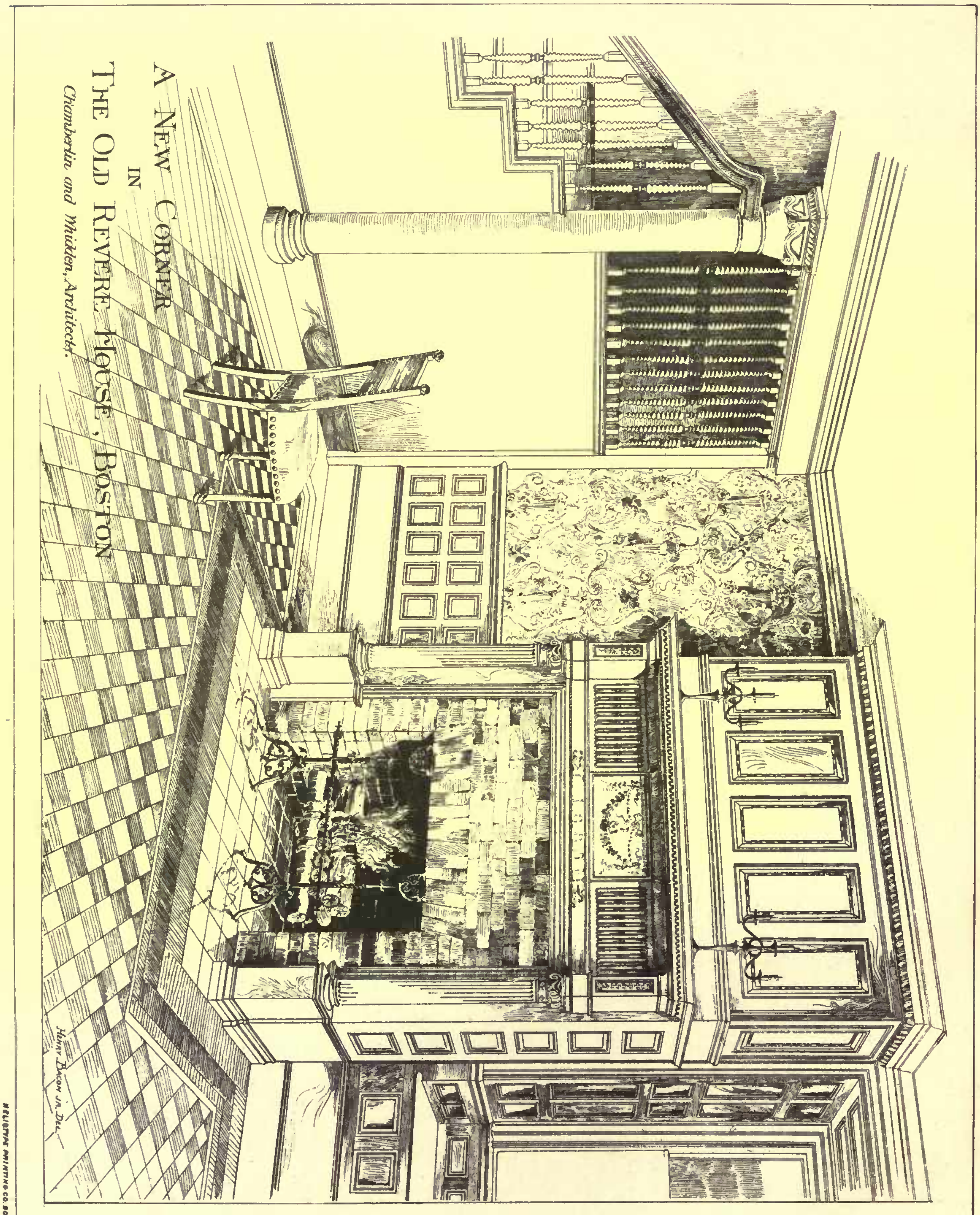
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DESIGN FOR A PORTE COCHERE, BY MR. WALTER COPE. A PRIZE DRAWING.



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A NEW CORNER IN THE OLD REVERE HOUSE, BOSTON

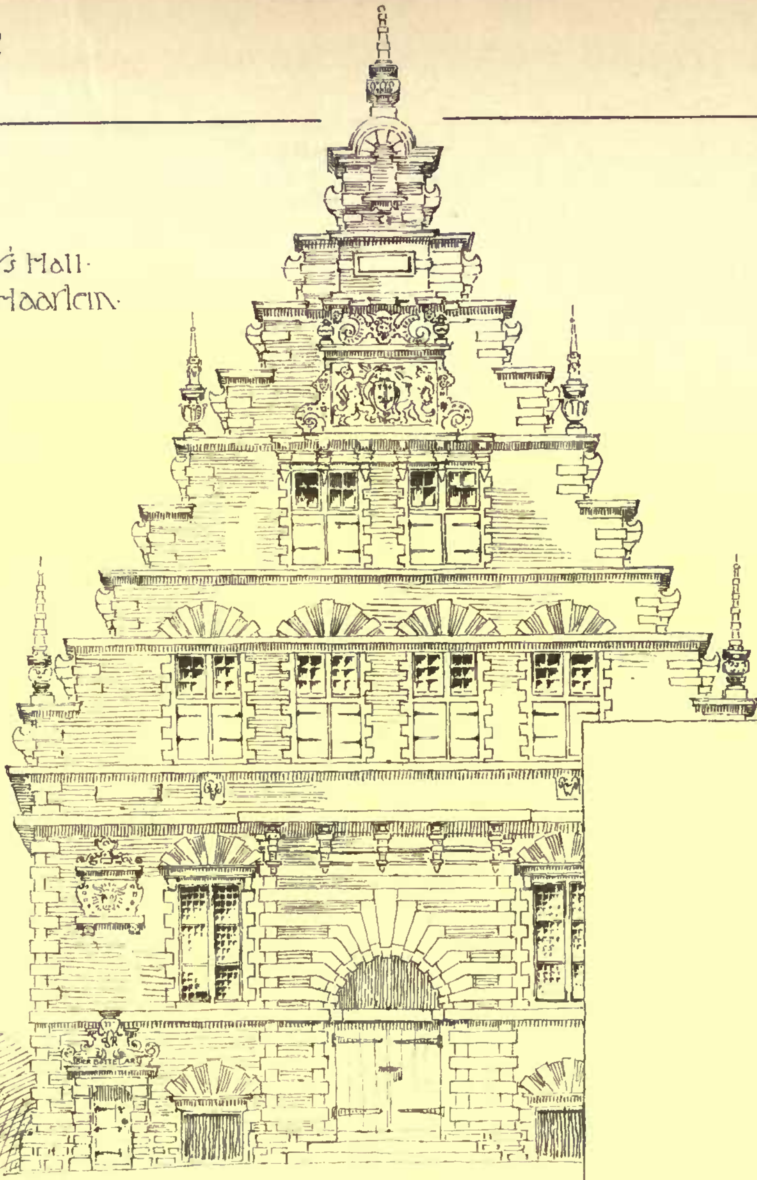
Chamberlin and Whidden, Architects.

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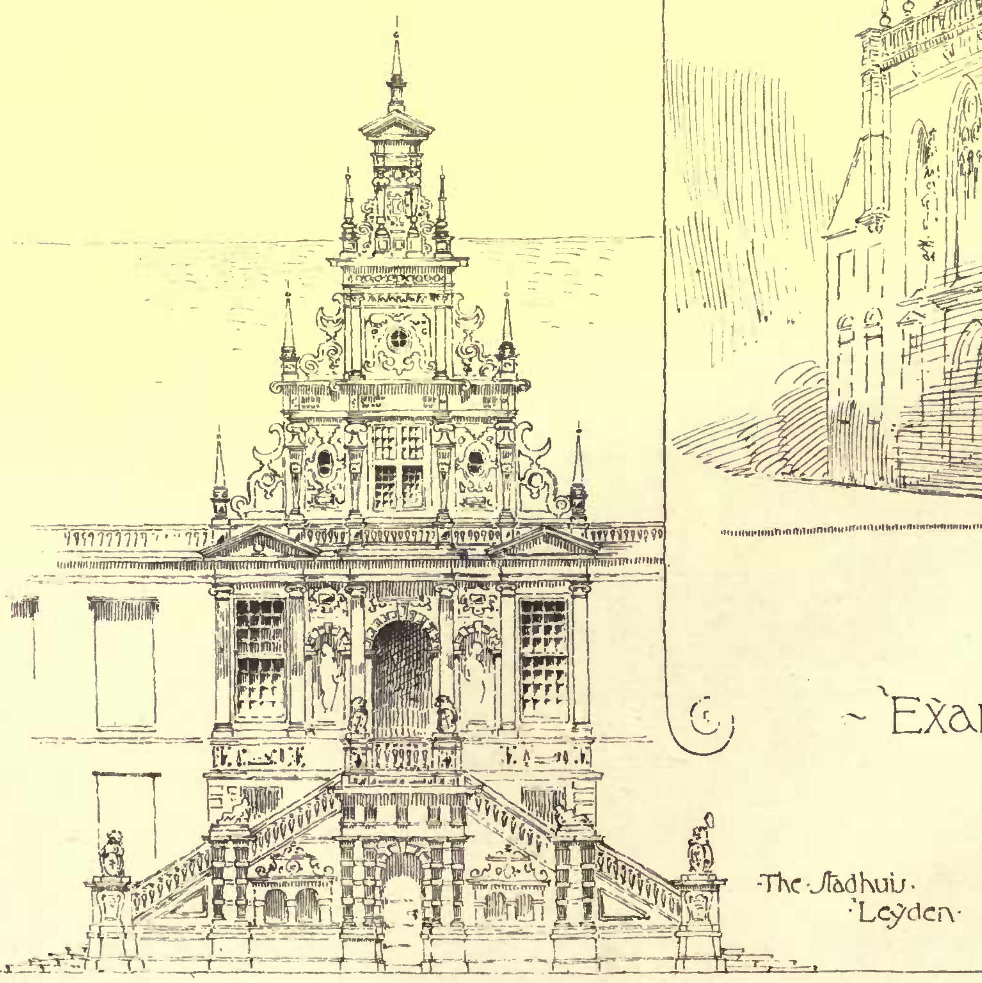
American Architect

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Flesher's Hall ·
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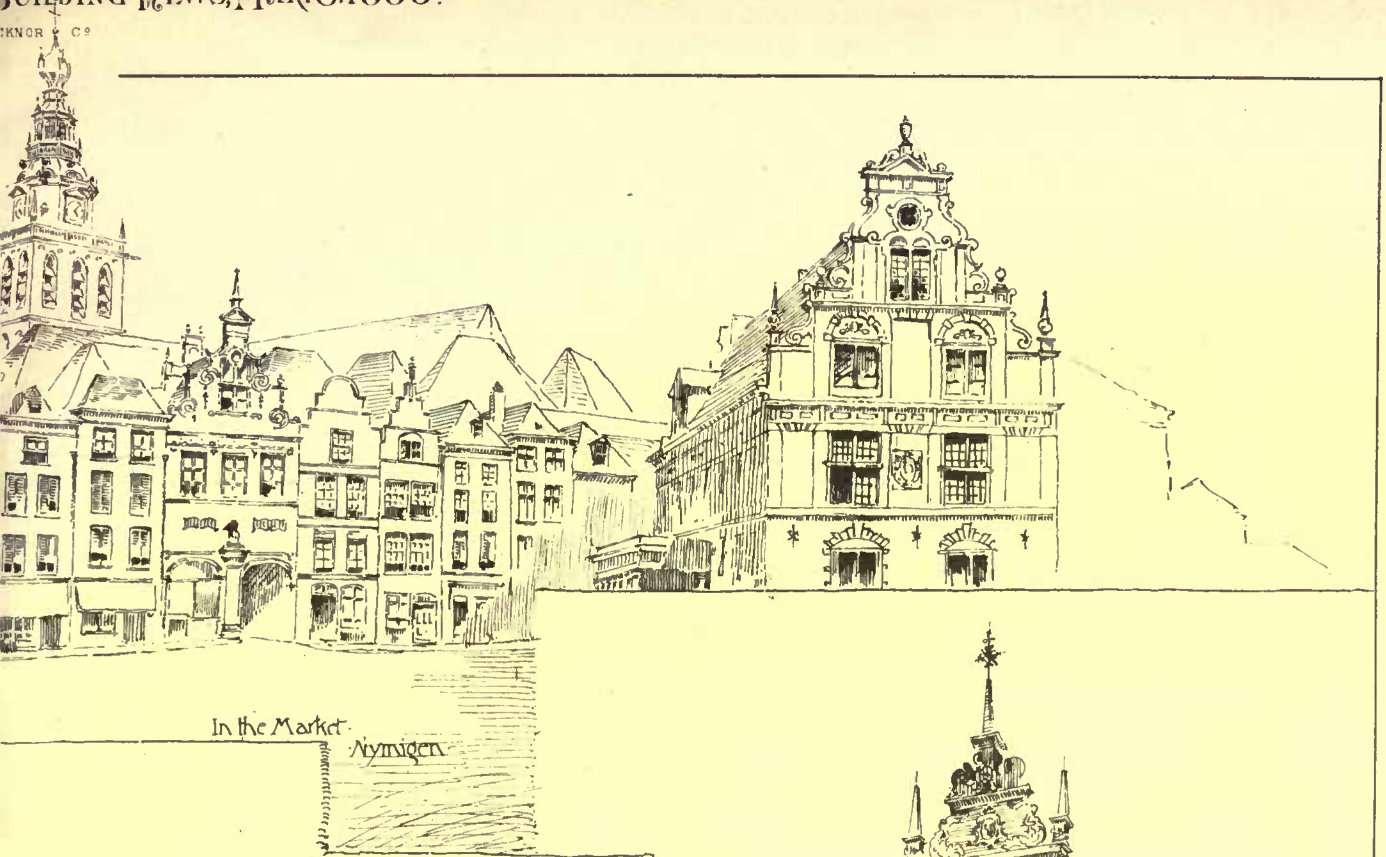




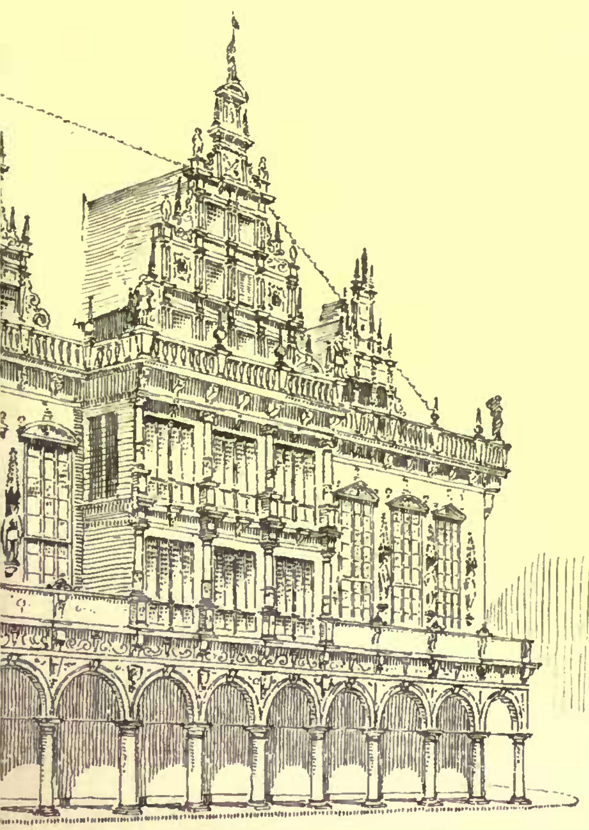
· The · Stadhuis ·
· Leyden ·

~ Examples · of ~
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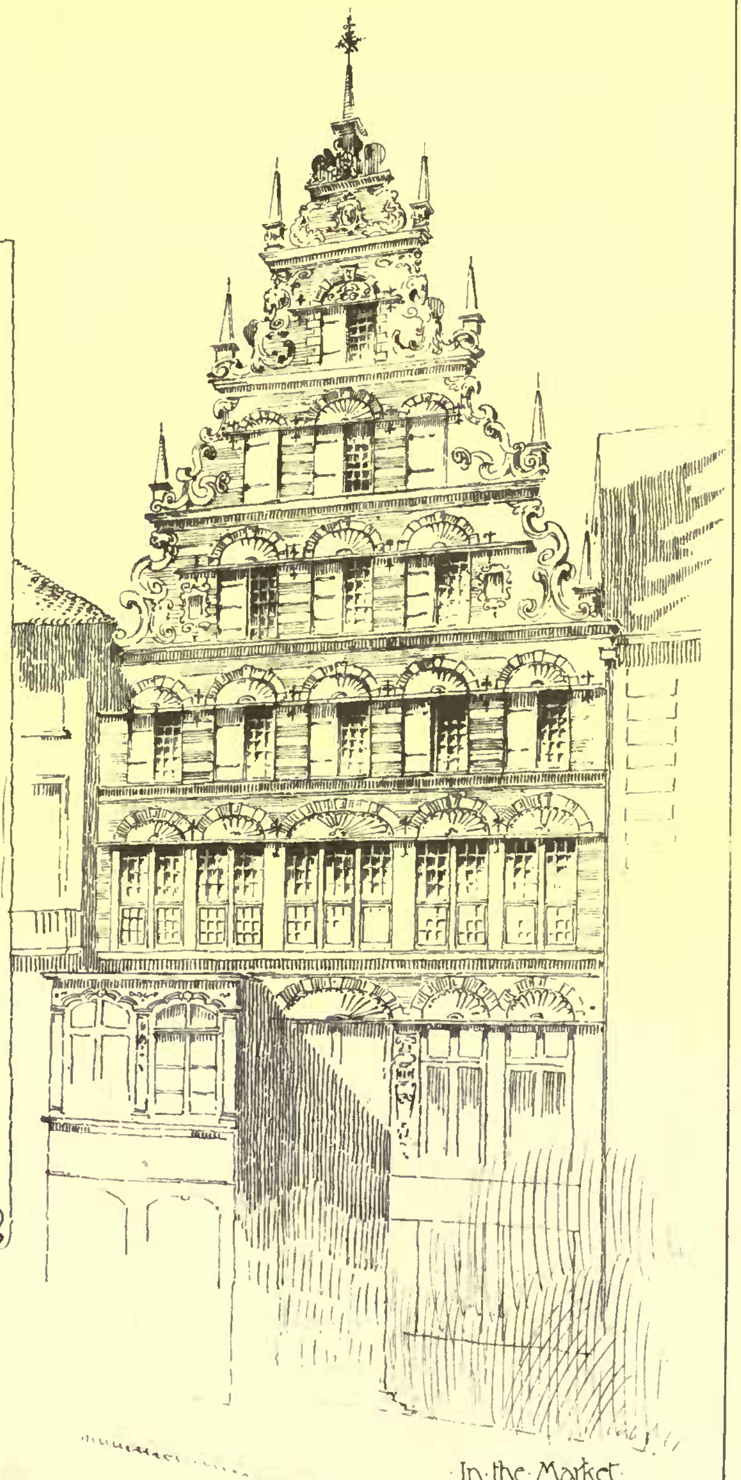
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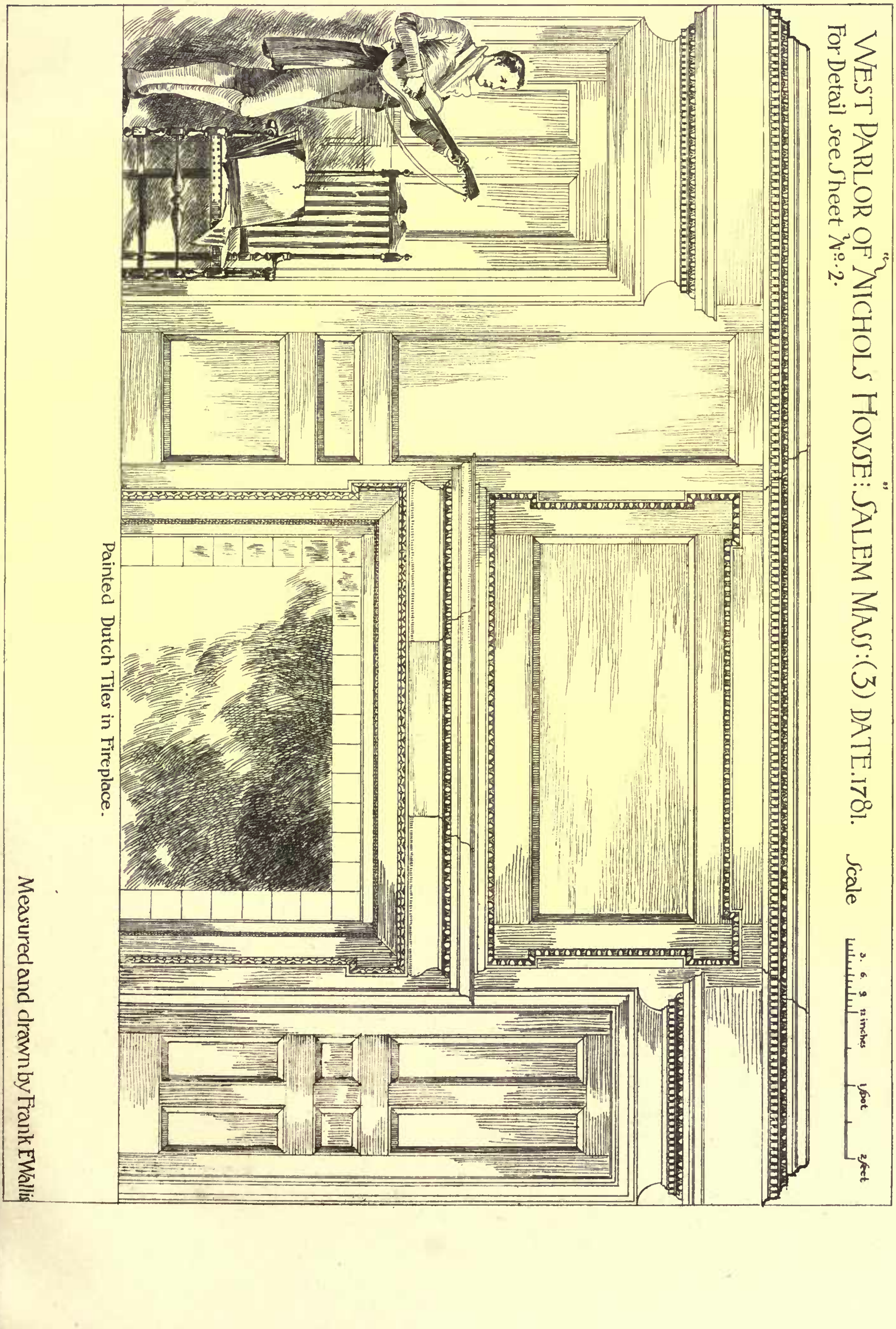
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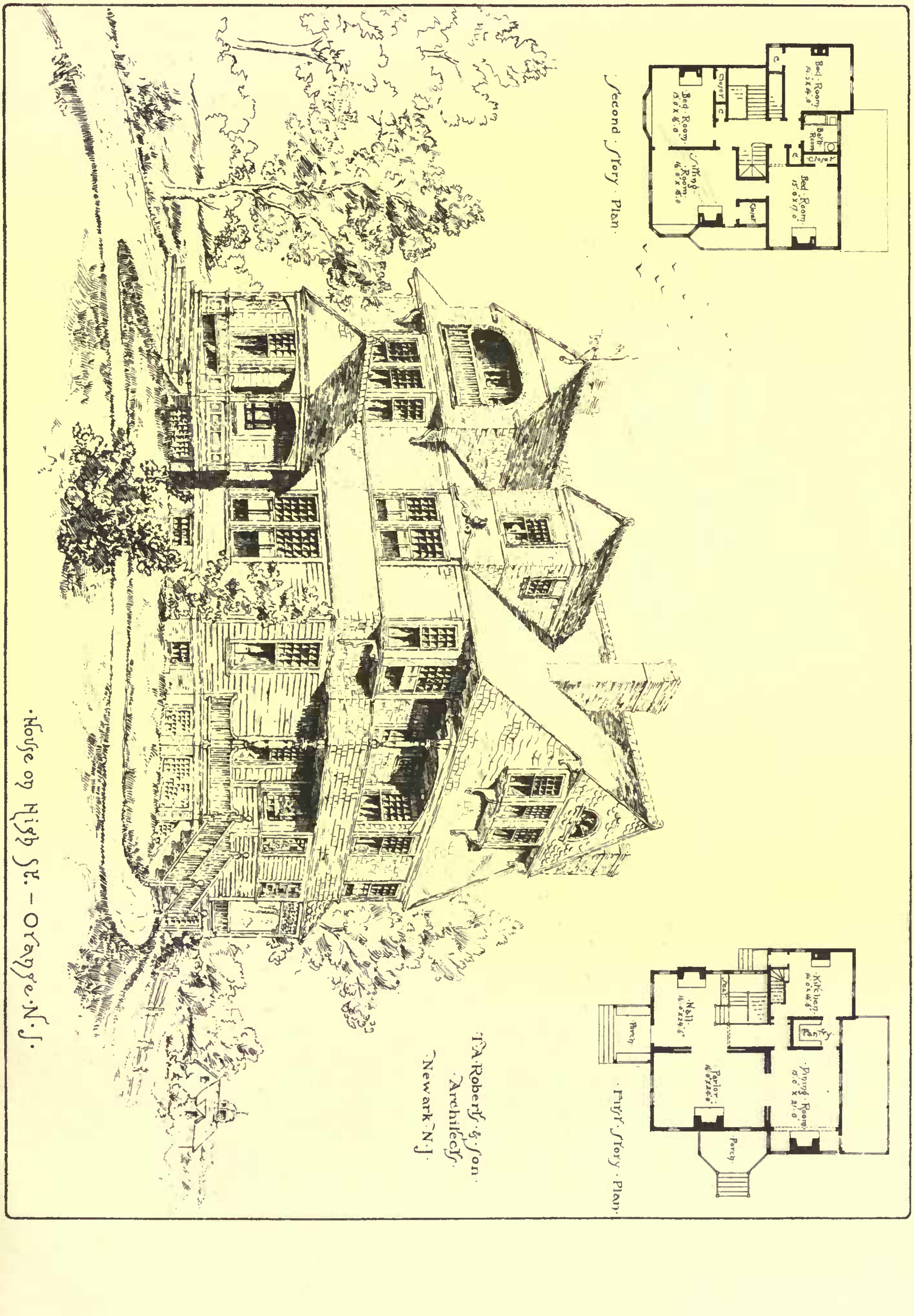
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safe from the Scandinavian pirates. Under such conditions the maritime cities were naturally the greatest sufferers, and hence were the first to adopt measures of self-protection.

In 1239 the towns of Hamburg, Ditmarsh and Hadeln entered into an agreement to mutually furnish soldiers and money to make navigation free and safe on the lower Elbe and the adjoining portions of the North-Sea coast. Two years later Lubeck joined the union, which then took the name of the Hanseatic League, from the old German word *Hansa*, signifying a union. Brunswick entered the confederation in 1347, and other cities came in so rapidly that by 1360 the League had become a recognized power in Europe, having its triennial diets, its standing army, and large fleets of ships for both war and commerce. Lubeck was the capital city, where were deposited the funds and the archives of the League, though the conventions were sometimes held at Hamburg, Cologne and elsewhere. The cities professed a nominal allegiance to the German sovereigns, but were practically free and self governed; and by reason of the growing power of the confederation, the kings and emperors were from time to time obliged to grant to the municipalities various rights and concessions, some of which are acknowledged to this day. When at the height of its power the League embraced eighty-five cities scattered all the way from Deventer and Bremen to Dantzic and Riga, with a few in Sweden and Denmark and one, Wisby, on the Island of Gothland. The prime object of the union was the protection and advancement of commerce, and to this end four great depots were established, at London, Bruges, Novgorod and Bergen. From these points the League practically monopolized the trade of Europe, and was able to dictate terms of trade on more than one occasion to England, France and Italy. With increase of commercial power, it speedily arrogated to itself political authority as well; and while in the period of its greatest prosperity was able to depose a king of Sweden and go to war against Denmark with 12,000 troops and a fleet of 248 ships; and when the citizens of London tried to turn out the monopolizing Hanse merchants, the League boldly declared war against Edward IV and compelled him to grant larger privileges, and submit to fresh exactions. But the League itself started the reaction which destroyed it, by teaching the other nations of Europe the value of the commerce which had been so much neglected prior to the thirteenth century. The English and Dutch rapidly gained the ascendency in the carrying trade; and when new channels were opened towards America and the Cape of Good Hope, the power of the League declined so rapidly that in 1630 it was formally dissolved. Hamburg, Lubeck and Bremen then formed an association under the name of the Free Hanse Towns, which lasted until 1866, when they entered the North German Confederation. Lubeck soon became a German port-of-entry, but Hamburg and Bremen have always remained Free Cities of the Empire, each being recognized as an independent State, with right to coin money and freedom from all custom-house dues. This arrangement, however, is not likely to exist very much longer, and probably within the next decade both cities will be absorbed into Bismarck's implacable scheme of German unification, and the last trace of the Hanseatic League will disappear from the face of Europe.

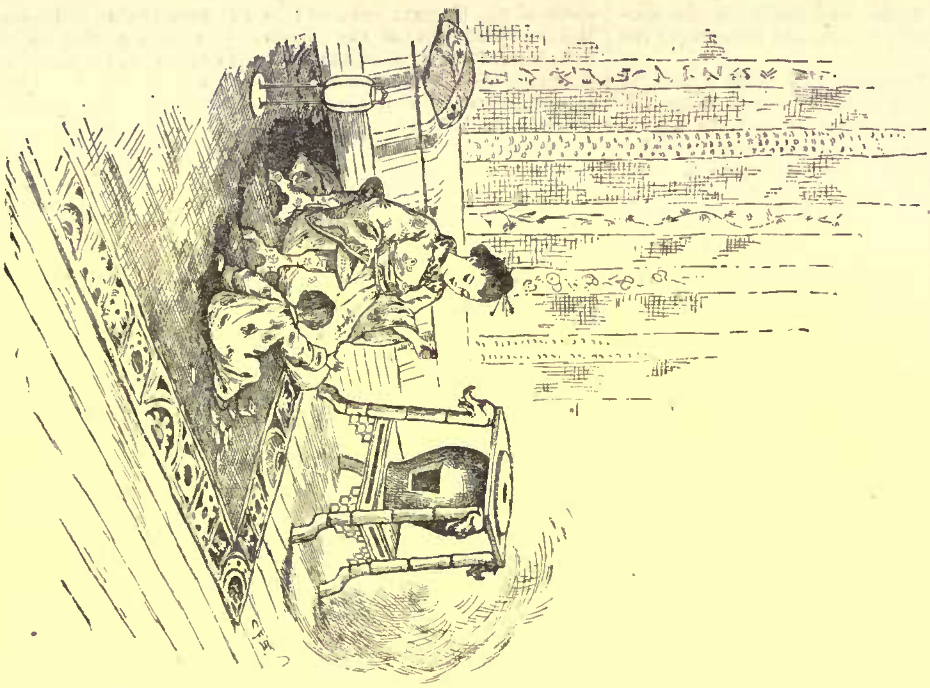
Such is the political and commercial history of this remarkable association. The architectural history of the cities which formed the League begins practically after the dissolution of the first union, at the time when Europe was enjoying a little peace from the convulsions of the Reformation. Most of the Hanse towns have had so confused and disjointed an art-history that not all of them can present monuments of interest to the architect, and the style which can be most truly designated as Hanseatic was fostered rather under the protection of the later union of the Free Cities. In noticing the remaining monuments of this style, our attention will accordingly be confined chiefly to Bremen and Lubeck, as these are the cities which have the most to offer; indeed, outside of them there is comparatively little left. Hamburg has preserved whole quarters of the earlier half-timbered houses, but all subsequent work has disappeared to make place for the meaningless modern style common to so many of the German cities. Perhaps it would be more just to designate the style as the early Renaissance of the north-west of Europe, for it appears never to have spread farther east than Brunswick, to any extent; but the title chosen seems more in keeping with the style as it exists in the two quaint old Hanseatic towns, both of which, as already explained, occupied a most prominent rank in the union, and preserved the traditions of the League for two hundred and fifty years after the great commercial alliance had ceased to exist as a power. The style was at its best where the Hanseatic League was the most enduring, and there we naturally look for the finest monuments.

The power of the League and its far-reaching commercial relations drew into western Germany a vast amount of wealth which was not absorbed into the erection of massive and expensive religious edifices nor diverted into kingly coffers, but being the property of the free-holding citizens was lavishly used by them in the erection and embellishing of the municipal-halls and corporation-buildings. Consequently in all of the Hanseatic towns the churches are of slight architectural value, while nearly every city has a number of good examples of civic architecture, a condition of affairs quite different from that existing in the southern countries, where architecture is primarily a religious art, and little is to be found but churches and abbeys. This of course is in part due to the sturdy, independent spirit of the German race, and to the secularizing influence of the Reformation, many of the religious structures having undoubtedly suffered at the hands of the Protestants; but under any other conditions of society than those produced as a result of the Hanseatic League, a quite different spirit, if not a different style of architecture would have been evolved. We will, then, give no attention to the Hanseatic churches, further than to state that while a few of them show some very interesting applications of brickwork, in the main they are quite uninteresting and lacking in monumental spirit.

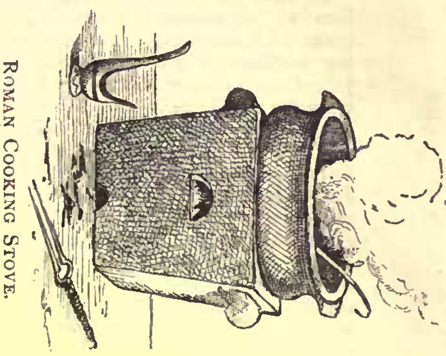
The Gothic period seems to have left but little trace on the Hanse towns. The public buildings erected were mostly of brick, more useful than ornamental, with a very few exceptions, and the common houses were built with half-timbered construction. But during the sixteenth and seventeenth centuries the spirit of the people, which had been practical and utilitarian in all its acts before, experienced its first and only genuine architectural impulse; and instead of freighting ships for the Levant and India, the people began to embellish their rusty town-halls and mansions, and take their ease at home on the money their ancestors had earned. Most of the Gothic civic work disappeared before this movement, or was so altered as to entirely lose its character. At this time the Dutch were succeeding to the naval supremacy which the League had held. Amsterdam, not Lubeck, was the capital of trade; and the style of architecture which the Hanse merchants adopted as their own came directly from Holland. It might be interesting to trace the manner in which this early Renaissance travelled all the way from its home in Florence, becoming Francis I style in France, Elizabethan in England, Flemish in Belgium, and changing into something in Holland which the Dutch art-historians claim as their own national development, while, in turn, the Hanse towns followed the lead, giving to the style a freer swing, a greater wealth of ornamentation, and a more broken, staccato movement to the sky lines than anything Dutch simplicity could ever have evolved. It might also be interesting to know what would have become of this much-changed Italian Renaissance had the march continued a step farther under conditions equally favorable to expansion. We have a suggestion of what such a development might have led to in some of the fantastic dragon-topped buildings of Copenhagen, and it is far from pleasing. Fortunately, when the Hanse towns had done all they could with their imported style, they began to go to sleep, and stayed asleep so long that now, when they are beginning to awaken to the nineteenth-century life, no one has the heart or desire to change the old buildings, and we can study the Hanseatic architecture in essentially the same condition it was two and three hundred years ago, without the presence of any later degeneracies of man to mar what few ideas the retired merchants managed to incorporate into their architectural efforts.

The development of the Renaissance in Holland is so much akin to the architecture of the Hanse towns that it seems worth while to consider here a few of the Dutch examples. And there are really very few buildings of this style to be considered, for although the Dutch set the fashion, they made so little of it that there are in all the country barely three buildings of the kind which are worthy of notice; namely, the Fleshers' Hall at Haarlem, the Stadhuis at Leyden, and the Asylum at Groningen. The first of these was built about the year 1603, if we may trust a much-defaced inscription in the gable. A sketch of the façade is given on the sheet of sketches published herewith. As the name implies, the building is used as a public meat-market, and is a simple rectangle in plan, with gables at front and rear essentially similar in design, a simple roof, and on the side towards the square a few elaborate dormers, a sketch of one of which was published in the *American Architect* of February 21, 1885. The materials used are old brick, with bands and mouldings of light sandstone. When it is stated that this is about as quiet and simple an example as the style produced, either in Holland or Germany, it will be understood how wildly extravagant some of the subsequent attempts became. In the Fleshers' Hall, however, the effect is by no means overdone; indeed, the building does not appear loud or obtrusive, even by contrast with the perfectly plain and sober Dutch private dwellings which immediately adjoin it on two sides. There are few carvings, fortunately, for the Dutch hardly excelled in decorative panels; the mouldings are very simple, and the proportioning of the brick and stone is quite pleasing in result; the stepped-gable ends rather prettily, with its shallow niche, its arched cornice, and final slender crowning pinnacle. All of the gable pinnacles, by the way, are of stone; and, considering how small they are, it is rather surprising that they should have endured so long without showing any signs of decay.

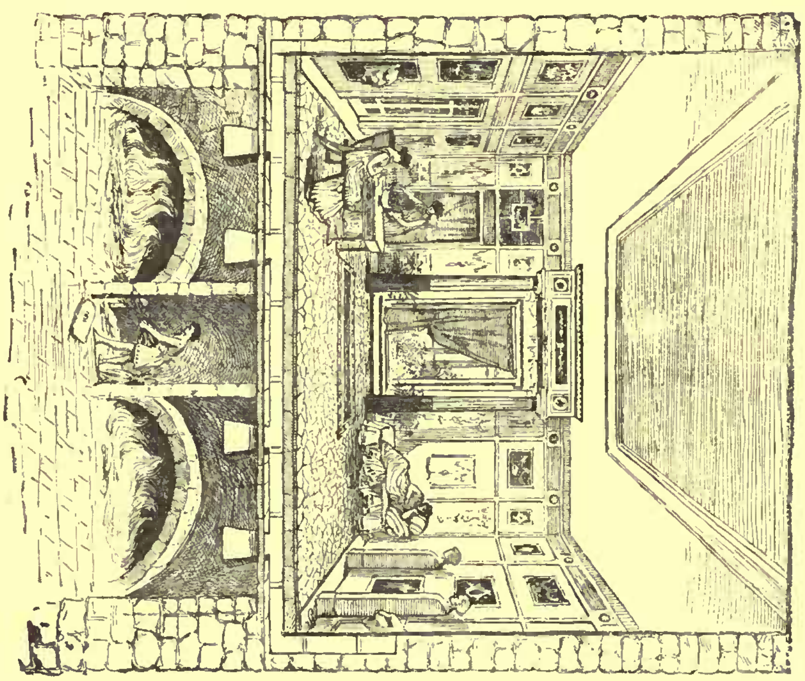
The Stadhuis, or Town-Hall of Leyden, is a more extensive building, and from appearances is a later example of the style than the one just noticed. In design, it is a long, low structure in two stories, the lower of which is treated as a high basement. The street on which it is situated is so narrow that it is impossible to have a good general view of the entire building, but the entrance pavilion, illustrated on the sheet of sketches, is quite sufficient to indicate the character of the design. Properly considered, the façade is in two distinct sections, one of which centres about the entrance-way shown here, while the other portion, apparently earlier in date, joins it on the right with the same general lines of roof, mouldings, etc., but rather better, though very simple details, and no entrance bays or domers to break the cornice. The façade is entirely of stone, a rarity in Holland where this material is so hard to obtain. Over



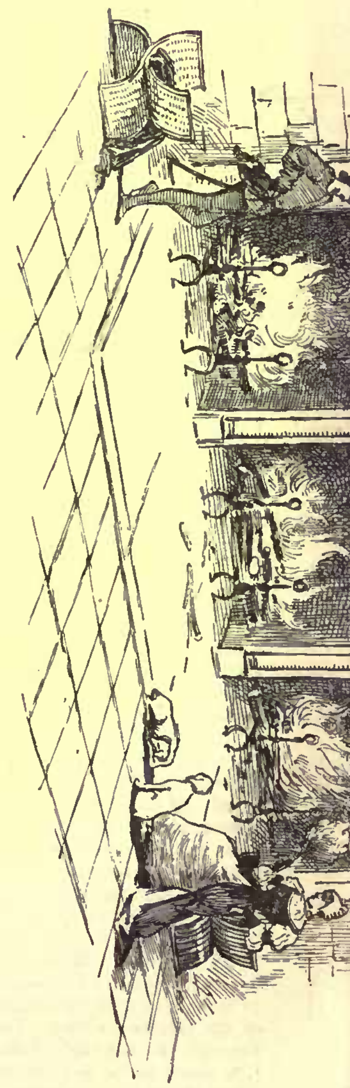
Chinese Brazier.



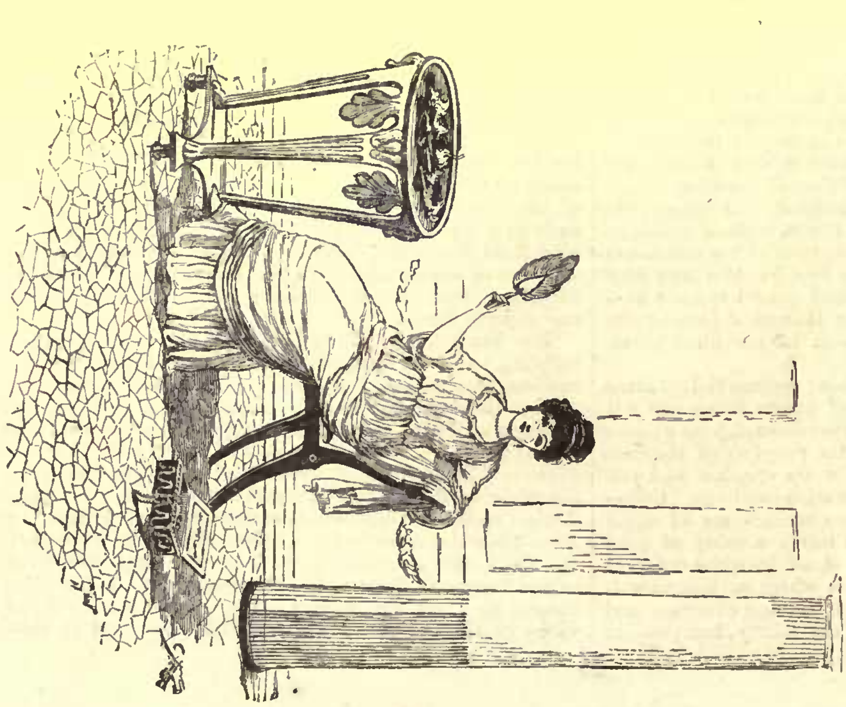
Roman Cooking Stove.



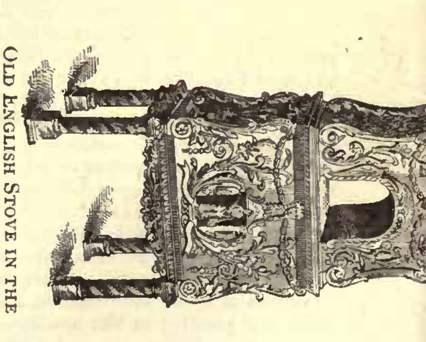
Roman Hypocaustum.



XV Century Open-Fireplace.



Pompeian Brazier.



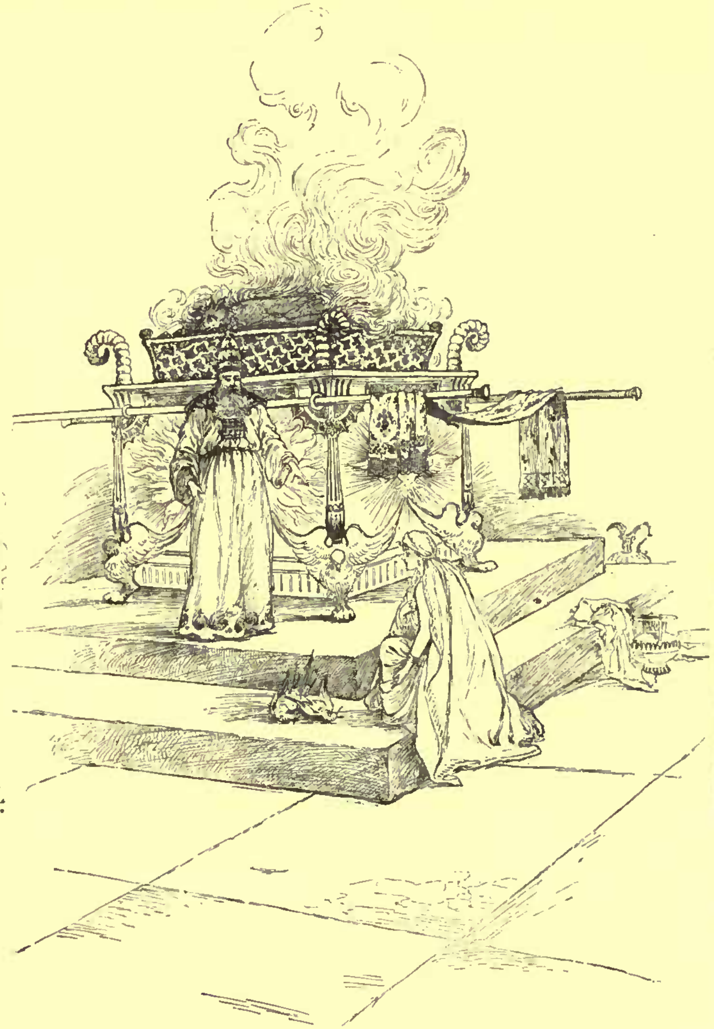
Old English Stove in the State Capitol, Richmond, Va.

Fireside and Kitchen Ancient and Modern

Barstow Stove Co



A Kalmuck Stove.



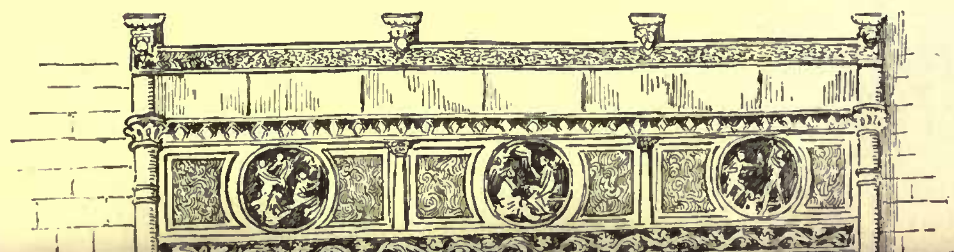
The Altar of the Tabernacle.



The Franklin Stove.



Swiss Coffee-Pot.





Chinese Cooking Stove.



the centre of the long line of unbroken roof rises a tall wooden tower or spire of a character which hardly adds to the dignity of the general design, being fussy and ungainly in every respect; though as is the case with so much that is architecturally awkward in the Holland architecture, it lends somewhat to the picturesque effect of the whole as seen from a distance down the long, irregular street, where all detail disappears and only the masses can be appreciated.

The difference between the Fleshers' Hall and the Leyden Stadhuis is so marked that one is led to believe the Dutch must either have made many other attempts between the two which have since disappeared, or else that their architectural inspirations came entirely from outside their own country. Probably the latter is the true supposition. Indeed, reasoning from analogy, it is impossible to trace anything like successive development in any of the few architectural styles which the people have employed. They always made up their minds in a very short time as to what they consider the proper type to employ, and used that generation after generation in exactly the same spirit, any change being a decided jump to something quite different. At Haarlem the design is a consistent use of brick, with horizontal bands of plain stone and a stepped-gable. At Leyden the orders are used very freely and the outline of the roof is hidden behind three rows of columns and entablatures. The Fleshers' Hall is the more straightforward and rational in composition, and can, perhaps, be called the more truly Dutch in spirit, and more decidedly an adaptation of native ideas; but the Stadhuis is by far the more pleasing and elegant design of the two. Note how gracefully the entrance pavilion builds up from the wide-spreading risers at the base to the slender obelisk crowning the uppermost pediment, and how skilfully the cumbersome flight of steps has been handled and worked harmoniously into the general scheme. Granted that the details are meaningless or bad; that the horns and irregular volutes filling the triangles of the gable are, to say the least, of a kind one would hardly care to see reproduced in America; that the little conceits of design are too fanciful to accord with the sober character of a Dutch town-hall; and that the main-story windows are too high, or the upper gable divisions too small; still there is so much that is pleasing about the scheme one can hardly help liking it, and, taken altogether, the Stadhuis is by far the best architectural effort that Holland has ever made.

The third example occupies a middle place, in date at least, between the Fleshers' Hall and the Leyden Stadhuis, but in design is quite inferior to both. There are, however, a few good suggestions about the façades, some interesting details and a scheme of gable treatment which might be worked out to a more successful arrangement. The building is too small to rise to any monumental dignity, and can only serve as a fairly good example of the style. Groniogen is a small town in the extreme northeastern portion of Holland, at one time annexed to the early German Empire, subsequently a member of the Hanseatic League, and finally captured by Maurice of Nassau in 1594, since which time it has belonged to the Dutch.

Before leaving the subject of Holland, there is a little village of Nymigen to be noticed. It is quite a small place, situated close by the thriving city of Arnhem, and hence only just within Dutch territory. Its only attraction is the irregular old market-place — a long line of quaint gables backed by the curious tower of the town church and fronted by the Stadhuis, a simple, unobtrusive, brick-and-stone structure in a semi-Hanseatic style, if such an expression may be allowed, the whole forming one of those lovely bits of picturesque quaintness of a kind found only in the northwest of Europe. It is given here merely to illustrate the style of private architecture which was practised in Holland at the time the newer Renaissance movement was forming, a style which was preëminently practical, but by reason of its very simplicity, always picturesque in effect. One of the most pleasing of the modern paintings in the gallery at Amsterdam is the view of the Nymigen market-place shown on the sheet of sketches given herewith. C. H. Blackall.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

OLD COLONIAL WORK, NO. III. DETAILS OF THE WEST PARLOR OF THE NICHOLS HOUSE, SALEM, MASS. MEASURED AND DRAWN BY MR. F. E. WALLIS.

The Nichols House, Federal Street, Salem, was built in 1781, by George Nichols, and is now owned by his grand-daughters. It is one of the most interesting houses in this quaint old town, standing dignified and with aristocratic pride, a little retired from the public way. The principal entrance is in the centre, under a Doric portico, the hall running through to the rear, between two large parlors, the subjects of our drawings. The west room was finished in 1781, with the main house, the east room remaining unfinished until the marriage of the owner to Sarah Peirce, his second wife, November 22, 1801, the ceremony taking place there; the mantel in this room is covered with papier maché ornaments, probably bought of Jackson & Co., London, as the same designs are to be found in their present catalogue. The mirror-frame is gilded, and is set into a recess prepared for it. The cornice, door-caps and architraves are very nice. In the west room the detail is older and more simple, the panels large, and carving well executed. Among other drawings of this set we have a drawing of the gate-post, which has a draped urn at the top.

DRINKING-FOUNTAIN IN THE OLD PORT, ALGIERS, AFRICA.

[Gelatine Print, issued only with the Imperial Edition.]

There are few who will not accord to the photographer who took the negative from which this view was obtained the rank and title of artist, and probably those who would incline to withhold the title, are those who will find it hardest to believe that this is not a copy of an oil-painting; for choice of subject, the arrangement and pose all seem to indicate the careful study of the painter of *genre* subjects — only all is so much better. We question whether the brilliant coloring of the actual subjects would not detract somewhat from the exquisite satisfaction that one experiences in looking at this graceful composition in monochrome.

FIRESIDE AND KITCHEN, ANCIENT AND MODERN.

A NEW CORNER IN THE OLD REVERE HOUSE, BOSTON, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

This drawing shows one of three new fireplaces in the lately remodelled café of the Revere House. The entire basement has been lowered a foot and reconstructed. The alterations include a new kitchen, bakery, billiard-room, toilet-room. bar and café. The café is finished in white and gold, and the walls covered with Tynecastle tapestry, of old ivory tone, picked out with slight touches of color.

DESIGN FOR A PORTE COCHERE. MR. W. COPE, ARCHITECT, PHILADELPHIA, PA.

This is one of the drawings to which was awarded first prize in one of the competitions of the T-Square Club, of Philadelphia, a coterie of whose doings some account was given some weeks ago.

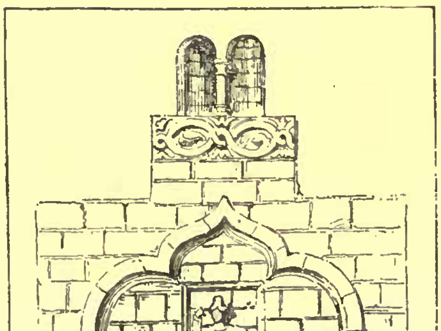
SKETCHES OF HANSEATIC ARCHITECTURE. BY MR. C. H. BLACKALL.

For descriptions see the article on "Hanseatic Architecture" elsewhere in this issue.

HOUSE ON HIGH STREET, ORANGE, N. J. MESSRS. T. A. ROBERTS & SON, ARCHITECTS, NEWARK, N. J.

THE ADMIRALTY BUILDING IN THE OLD PORT, ALGIERS, AFRICA.

A DAMP HOUSE.



Doorway at Avila. Spain.
(Rep. Gen. Soc. Arch'ts Paris)

Under this title Professor T. Roger Smith, F.R.I. B.A., delivered a free public lecture under the auspices of the Sanitary Assurance Association at the Parkes Museum of Hygiene, a few weeks ago. Sir Joseph Fayrer, K.C.S.I., M.D., F.R.S., occupied the chair. The lecturer remarked that damp might be fairly termed the scourge of England, and the train of diseases resultant on its presence was a long and deadly one. Damp was water in the wrong place, to paraphrase a well-known definition, and water would penetrate and lodge in almost all our building materials. Another familiar but important fact for consideration was, that atmospheric moisture was deposited as the temperature fell, and absorbed as it rose. It was mainly through the atmosphere that our houses became damp. The reasons why the presence of damp was prejudicial to health was a subject beyond his present province; but two of these might be mentioned — that the air could not then carry off the moisture exhaled from our bodies and lungs, and that the presence of moisture facilitated the growth of germs, a familiar instance of which was the "dry rot" attacking timber kept in a dark place. The lecturer next asked where the dampness came from which existed in many buildings. The sources were five-fold.

First, the water used in building operations, which was more considerable than would at first be apparent. A competent authority had assumed that on an average two hundred gallons of water were used to every rod of brickwork, of which there were about ten rods in an average ten-roomed house, and half as much more must be allowed for the water used in plastering. These 3,000 gallons of water would fill a tank five feet by four feet by two feet six inches deep in every room, and this was obviously a source of danger for a long time. There was no remedy for this cause of dampness, which must dry off out of the building. The best cure was to allow a strong current of air to pass through the house; the window openings should be unclosed as long as possible. The burning of large fires in the house considerably assisted in drying the house; but the burning of gas was less efficient as it provided fresh water by the products of combustion.

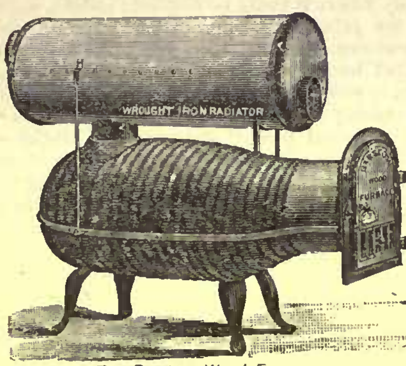
Ligny's process of drying was now being adopted by which dry air was blown into it by the builder, which seemed likely to be serviceable; but the free current of air was the best cure. Something could be done in the way of minimizing the amount of water employed in the work, and the building operations, where possible, should go on slowly. A second source of dampness was the water rising from below. The risk of this was greatly increased by an injudicious choice of site. Clay was the worst soil, chalk and gravel drier, but most soils were more or less moist. The subsoil was damp, and often contained underground water-courses; and if the slope of site was towards the house the danger was increased. If porous bricks were built into a damp soil the lower course of bricks acted as a wet sponge, and the moisture rose by capillary attraction. The danger was increased if basements were laid with a damp subsoil, for then the substance of the floor itself was charged with moisture. Then there was the leakage from defective water and drain pipes and drains, and underground cisterns supplied a large damp surface accessible to the absorption of the houses covered in, and they might also be leaky. The precautions to be taken were, first, to adopt a damp-proof course, now happily compulsory in London under the Metropolitan Building Act; many materials could be employed for this purpose, such as tar and sand, slate, and tarred felt, but the least efficient was a bed of cement, and the best was mineral asphalt. A damp-course of vitrified earthenware was also excellent. It was very usual in the present day to spread a bed of concrete under the entire floor surface, but while of some good, it was not much, although it was provided under the present Building Act. It was best to avoid basements wherever practicable, and to provide a dry area around the house, either by excavating it away from the walls or by draining it, and good material should be laid under any solid ground floor, but better still was an ample clear air-space below the floor, through which a current should be encouraged to pass. Where the house was already built, and was damp, a damp-course could not be inserted except ineffectively and at great cost, but the contact with the earth could be cut off by an area, or dry area; the earth could be removed from under the floor, and the site could be drained, and remove all drains, tanks, and cesspools from near walls. Any solid floors should be relaid, if possible, with asphalt beneath, and it is in some instances beneficial to put in a catch-water, or interrupting drain, between any source of moisture and the building. He would next deal with the third source of dampness, moisture from outside — *i.e.*, that passing through the doors, windows, and other inlets.

Except granite, which was rarely employed, all building materials, especially bricks and concrete, were more or less porous, and even in granite the mortar or cement was pervious to moisture. Every wall would absorb some moisture, even on a damp day; but it was chiefly rain, driven against it by wind, that saturated a wall. Even limestone walls two feet and three feet thick would let the wet drive through, and so would solid brick walls, and most at the weather-line and below it. Once a wall was saturated the warmth of the interior attracted much of the water inwards through the plaster. Some bricks would absorb one-tenth of their own weight of water, and facing bricks were among the most porous. Where water came in in any quantity — *e.g.*, under a window-sill, the risk of soakage was very great. The best mode of prevention was to build with best materials, especially for the outer face, and this outer face should be strong and sound, with joints thoroughly flushed and trowelled hard. An open joint meant a lodgment for water. In exposed situations he should build, or at least point it, in cement, or, at least, a few courses just above the ground line, and the building should be so placed that it might receive both sunshine and air. The best precaution against penetrating moisture was to build with hollow walls, with iron or earthenware ties, with a dip in the middle. For the inside wall a half-brick thickness was sufficient. The late John Taylor, in building houses on an exposed site at Birchington-on-Sea, adopted the plan of filling the cavity in his double walls with slates, which completely kept out the driving rain. In Cumberland the plan adopted, and with success, was to lay the stones with a joint sloping downwards. In London cement was applied to walls with little useful effect, although Portland, if pure, was nearly water-tight. An attempt was sometimes made to fill the pores of walls with silicious materials; but the work was not generally done with sufficient thoroughness. Painting the surface amounted to much the same as the last experiment, but was less effective. There was a natural induration of the surface in town, which resulted from the deposit of oily particles of smoke on the surface, and this was believed in some measure to act as a water-proofing. Tiling and slating the outer face was an excellent remedy where it could be applied; indeed, such a facing was formed on the principle of the hollow wall. With regard to hollow walls, it was sometimes proposed to fill the cavities with hygeian rock asphalte; but he questioned whether, although excellent for damp-courses, it was not too impervious to water, and so prevented insensible breathing through the wall. Certain remedies could be applied to the internal face of the walls, but all these were less satisfactory. The surface could be lined with Portland or Keene's cement, or with tiles in cement, or even with a lining of lead. Battening the wall, or covering it with canvas kept the evil out of sight, but the damp was still present, and would penetrate into the room when a fire was lighted.

The chief remedy was the thorough repair of all defects in the surfaces, and the removal of shrubs, trees, and everything which prevented the sunshine and air from striking on the walls. In proportion as the dwelling stood free from trees and adjoining properties would it be healthy and cheerful. The damp entering the house from imperfect windows was serious and often most inconvenient. Sashes were for this reason preferable to casements, and should be fitted with deeper bottom rails and inside linings than was usual. If casements were employed, the French plan was the best, and where that was inadmissible, good fillets and fastenings should be adopted. The best plan was to add a second inner window, making a cavity chamber, and preventing the loss of heat from the room. He must now consider a fourth source of dampness — that caused by water penetrating from above. The top of every wall, if left flat, was a weak spot from which the water would soak down. The upper parts of parapets, party-walls, and chimneys, were liable to soakage from rain driving upon them. Defective roof-coverings often rendered a house damp, and they were injured by stone-throwing, wind, slater's repairs, and the progress of decay in the woodwork beneath. All walls should be provided with a sloped coping, as was required by the Metropolitan Building Act, cornices should be inclined outwards, and protected by lead or cement capping, and great attention should be given to the junctions of roof and walls. A damp-proof course between the eaves level was a useful protective measure, and where possible it should be built through chimneys and parapets. In France slates were secured, not as with us, by nails near the top corners, but by long copper hooks at the bottom of each slate, and he was assured by French architects that the cases of stripping by wind were greatly lessened by this practice. Flat roofs were especially liable to failure to carry off rain-water and to injury from sunshine. The lap of slates should be deep, and the pitch ought to be acute enough to protect the under surface from soaking. Where a roof was leaking repairs were usually unsatisfactory. A fifth source of evil was the moisture generated within the house. Tanks of water afforded large evaporating surfaces, and to a certain extent kept the air in the floors above moist; and the combustion of gas also charged the atmosphere with moisture, and the presence of a large number of people relatively to the size of a room increased this. Wherever possible tanks under floors should be abolished, or, at least, emptied, gas might be replaced by the electric light or candles, although it was perhaps too handy and cheap to be dispensed with, and if it must be retained, care should be taken to ventilate each burner. In conclusion Professor Smith summed up his advice by recommending his hearers, if they had a damp house, to leave it; if they could not escape from it, to examine all sources of possible damp, one by one, and apply to each the remedy that seemed most likely to be effective, and in a thorough way. In selecting a house, he would urge them not to follow the fashion of selecting a newly-built one, to look narrowly for all signs of wet patches on walls or with a musty smell, or situated on a low, flat site. The only prudent course in choosing a house was to search for it, not on a fine, sunny day, but on a wet one. The person who lived in a damp house ran a great risk to health, and he who turned a damp into a dry dwelling did a good and useful work.

Mr. E. C. Robins, in seconding a vote of thanks, which had been proposed by Mr. H. Rutherford, mentioned that in repairing Hanover Chapel, Regent street, built by the late C. P. Cockerell, he found the masonry of walls, wherever it had been coated with oil, impervious to wet and in good repair, whereas in the towers, which were not so treated, it was disintegrated. He doubted if the lecturer's objection to the hygeian rock composition was well founded. Mr. T. M. Rickman, F.S.A., remarked that wherever two materials were brought into contact an opportunity was given for the ingress of damp into a house. The modern practice of combining eight or ten materials in the surfaces of a dwelling was to be condemned on this ground. The material which withstood the London atmosphere best, in his opinion, was Portland stone. Mr. Thomas Blashill, F.S.A., had never known a case where wet had been driven through the substance of a brick or stone wall. The cause of the dampness in rooms was the condensation within the apartment, and could be cured by ventilation. Few people realized the dampness caused in a house by the use of gas, which was of no value for drying purposes. The Chairman having given his experiences of the effects of damp in India, where he found it was the greatest lethal influence with which the medical man had to combat, Professor Roger Smith briefly replied upon the discussion, reiterating his views as to the bad effect of building into the cavities of walls a material impervious to air, and indorsing Mr. Rickman's recommendation of Portland stone as a building material for London — *Building News.*

THE EVOLUTION OF HEATING-APPARATUS.



The Barstow Wood-Furnace.

In commemoration of its semi-centennial, and in honor of its founder, the Barstow Stove Company issued a short time ago a very attractive little *brochure* on heating-apparatus, ancient and modern. We were so much pleased with the character and quality of the illustrations,[1] that we have asked permission to reproduce them, and the descriptive notes ralating to them, in spite of the fact that many of our readers may have seen them in their original form:

Man, except in the very lowest form of civilization, usually prepares his food before eating, by some sort of artificial heat. In the earliest period of the world's history this was accomplished by very crude and simple means. We read of Noah taking all manner of food into the ark; but with no chimney, and but a single window and door, heat could not have been applied until after he had landed on Mt. Ararat. Here, the Bible narrative tells us, he built an altar and offered burnt offerings to the Lord.

A little later on, but still very early in the history of the world, we read of Moses giving orders to Bezaleel, a man possessing great knowledge and skill in all manner of mechanical workmanship, to devise and cast a brazen grate of network for the altar of the Tabernacle, for burnt offerings.

Portable stoves are mentioned by several writers as having been found in the ruins of Pompeii and Herculaneum, with charcoal as fuel. There were no chimneys nor fireplaces discovered in any of the houses, and the inference is that these stoves or braziers, containing ignited coals, were carried from room to room alternately, as necessity required.

The Chinese and Japanese also used small braziers in cold latitudes. They were often made in peculiar shape and fantastic style, with a pottery centre for the coals, and mounted in a wood or bamboo framework.

The Egyptians, Persians, Assyrians, Greeks and Romans have been noted throughout all ages for the magnificence and grandeur of their palaces and temples, the sublimity of their tombs and sepulchres, and the beauty of their monuments and works of art; but they had little or no idea of domestic comfort and luxury. This could not have been through ignorance, for they have given wisdom to the world on many points; nor through a want of knowledge of the laws for generating and diffusing artificial heat; for their baths were warmed by fires underneath the floors, and the palaces of the patricians, on the hills around the city of Rome, where the atmosphere is chilly and cold parts of the year, were warmed by "stoves" in subterranean places. Unquestionably, however, the word "stove," as here used, does not mean the cast-iron machine of the present day, but is used in its Saxon sense, meaning a hypocaust, which was a subterranean chamber, several feet in height, below the apartment and closed on all sides. The tops of these chambers were arched, and consisted of very thick pieces of baked clay and tile, jointed together with cement. In the roofs were square pipes also made of clay, through which heat was conveyed into the apartments above. Pipes of like kind built into the walls of the lower apartments rose into other apartments on the second floor, where their outlets were ornamented with figures of lions' heads formed of terra-cotta. A narrow passage-way, about two feet in width, divided the subterranean chambers, and fuel was thrown through square openings on each side of this passage-way. The floors were composed of coarse mosaic-work, and the walls of ornamented marble.

Open fireplaces with jambs and chimneys were quite unknown until about the middle of the fourteenth century. They increased in favor rapidly, and soon became a study for the architect, designer and decorator; and in the following centuries down to the present time they afford opportunity for the display of art, genius and skill. France, perhaps, contains more beautiful and elaborate fireplaces than any other country. Those in the drawing-rooms and bed-chambers of royalty, the halls and palaces of the nobility, and the dwellings of the wealthy are embellished with gorgeous sculpture and delicate tracery.

Italy has also many fine fireplaces. In Rome, Venice and Florence they are nearly equal in elegance and artistic taste to those of France. The Italian *kitchen* fireplaces, however, have a peculiarity of their own and are quite picturesque. We give a sketch of a fireplace for cooking in an Italian inn near Serravalle. It is built in a deep niche, (not unlike what we call a bay-window). A large, flat slab of stone, about eight feet across, is raised several inches above the floor. On this slab a pair of common andirons is used, on which wood is burnt, and over which are suspended pots, kettles and other cooking apparatus. Around the bottom of the funnel-shaped hood over the fire a woollen curtain is hung, to insure catching all the smoke and fumes.

Heating stoves were made in Holland, Germany and England at a very early period, but in construction they were quite unlike the stoves of the present day. They were large, clumsy and uncouth, and although still manufactured in form similar to the originals, they find little market outside of the countries in which they are made.

Dr. Franklin invented in 1742 what he called an "open stove," but which may more properly be called a cast-iron fireplace. From this



Kitchen Fireplace at Serravalle, Italy.

invention is derived the term "Franklin stove," now commonly applied to all open-front stoves.

Down to this period, almost the universal mode of warming and cooking was by the open fireplace, composed of brick or stone, with wide yawning jaws and capacious throat, with crane and pendents for suspending pots and kettles over the fire, and hooks, shelves and cupboards, on which were hung and packed all kinds of culinary appurtenances. It was always provided with a generous oven at the side, and in such ovens our New England grandmothers did their famous cooking. These fireplaces did double duty, for around them at night gathered the family; the good housewife to do her mending, and the old man his reading. The high-backed settees were often used, so the heat would not be lost in the back of the room.

England, during the latter part of the last century, made some improvements by adopting the ideas of Dr. Franklin, and the ironmongers of that day reaped large profits by imitating and manufacturing his inventions. Had it not been for Dr. Franklin, neither England nor America would ever have heard of Count Rumford's stoves, which in the main were but copies of Franklin's inventions.

Many of these old Franklin stoves are still in use in farm-houses and country mansions, just as they were made in 1742, and many imitations and later styles are now being made every year. Franklin also invented, about this time, a grate, or "circular fire-cage," as he called it. It was fixed in a fireplace on an upright stem, the upper end of which branched outward and upward, holding the body of the grate on its axis, which was revolved or turned upside down alternately, bringing the live coals on top when desired. He also attempted improvements upon a stove with a down draught, which he had seen in France. While in London, about the year 1770, or perhaps a year or two later, he writes to a friend in Boston as follows:—

"You may have from this country a machine for the purpose of heating a meeting-house, cast from the same patterns with those now used at the Bank and that in Lincoln's Hall, which are placed in the middle of the reception-rooms. They are in the form of temples, cast in iron, with columns, cornices, and every member of elegant architecture."

We believe that the stove ordered by the Governor of Virginia for the House of Burgesses, from England, about 1770, and now in the State Capitol at Richmond, to be the identical stove referred to by Dr. Franklin in the above letter. We know of no other stove of the kind in the country.

During the present century America has developed more and greater mechanical industries than any other country in the world. The steam-boat, the cotton-gin, the sewing-machine, the revolver, the telegraph, the telephone and the type-writer all owe their origin to this country. But fully as conspicuous as any of these is the "American stove," which is unquestionably one of our crowning triumphs.

It will doubtless be amusing to our readers to compare the modern American heating and cooking stoves, with the illustrations, showing the rude manner in which cooking is done at the present time in certain parts of the globe; all of which were sketched by our artist

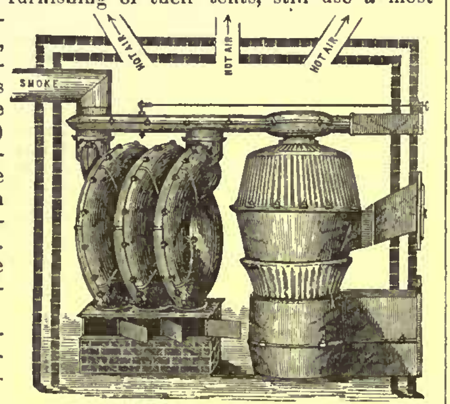
[1] We are requested to state that these cuts are copyrighted. — Eds.

while travelling through Europe during the summer of 1885, and forwarded to us as curiosities, which they certainly are.

The Roman cooking-stove was sketched from an original in the Crystal Palace. The body is of terra-cotta; the vessel on top is of bronze. They are used to-day in many small towns and villages in Italy.

This rude stove, also sketched from an original, is used at the present time in China. It is made in this form both in terra-cotta and stone, more commonly in stone.

The Kalmucks, a tribe of wandering nomads of Eastern Russia, noted for the gorgeous furnishing of their tents, still use a most primeval and rude arrangement for cooking, of which we give an illustration. Upon this rude stove is cooked the "jigot," (leg of mutton) always used at their marriage festivities, the bone of which is preserved in the family tent, and considered a sacred thing. Under the tripod the fire is kept constantly burning.

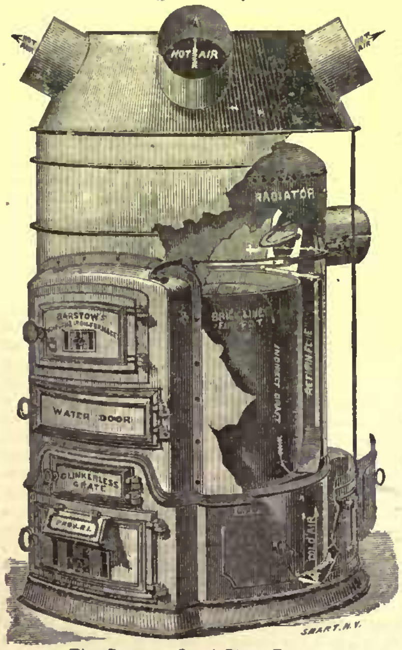


The Spiral Furnace.

Our artist also sketched for us while in Switzerland another curiosity, showing, as it does, the manner in which some of the cooking is done in the country and small towns of that Republic. The fuel used is wood, the ashes of which are kept in great heaps to retain the heat, the long legs being a part of the pot. This sketch was made from one in actual use.

Early in the Forties we invented our first hot-air furnace for warming all parts of a building by a single fire in the cellar. This was called, The "Platform Furnace."

This furnace was introduced under many and great disadvantages, including the inexperience and ignorance of local dealers in properly arranging the pipes for conveying hot air through wooden partitions with safety from conflagration; the fears of timid people and the objections raised against it by Insurance Companies; grave and doubtful expressions from the medical fraternity as to its effect on the health of occupants; also the unusual and additional cost necessary for putting into the cellar of a building an apparatus with branches leading to every room in the house, and many other serious objections which retarded its general introduction for some years. Slowly, but surely, however, we pushed the system forward, until now, no building of any size whether used for a dwelling or for other purposes, is considered complete or scarcely fit for occupancy without this method of warming it from one fire in the cellar.



The Barstow Steel-Plate Furnace.

We were not long in this new enterprise without competition, which we rather encouraged than avoided, for the field was large, and every competitor was a worker to lessen the prevailing objections against the system. And as furnaces multiplied, prejudices against them were overcome and dissolved. The Platform furnaces proved the correctness of our theory so satisfactorily, we soon after made others, and among them the "Spiral Furnace." These furnaces were all made for brick setting, but about this time we also made a portable furnace. the "Hedenberg."

The principles involved in the construction of all these furnaces were so novel, and their operation was so successful that extensive imitations of them soon appeared. Before the end of that decade patents for *ten* furnaces had been issued to parties in different parts of the United States for inventions of "Air-Heating Furnaces" and "Hot-Air Furnaces," a distinction without a difference.

During the next decade, or from 1860 to 1870, the increase of inventions was too great for enumeration. Within the last twenty or twenty-five years several contrivances have been introduced by various inventors intended to displace the hot-air furnace, but all have met with indifferent success. Hot water was found inadequate, except for warm climates, or in summer resorts. Steam does very well in manufacturing establishments, hotels, halls, and large public buildings, where pure air and proper ventilation are often secondary considerations. Heating and ventilating our homes are inseparately connected.

We are entirely satisfied and fully believe, after a practical experience of nearly half a century, that there is no method or means of warming a dwelling with a central fire, equal to a properly constructed hot-air furnace with suitably arranged pipes.

Early in the seventies we introduced our wrought-iron furnaces, in order to supply the growing demand for heaters with the radiating surface composed of a metal less porous than cast iron. After these followed our steel-plate furnaces as now made.

COMMUNICATIONS

GRAPHIC ANALYSIS.

NEW YORK, February 19, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — At "*Carpentry and Building*" Publishing Office they cannot find any papers by Kidder on Scheffer's method of strains in arches. Could you state just where the papers may be obtained, and oblige, Yours respectfully,

GEORGE MARTIN HUSS.

[We should have said "*The Builder and Woodworker,*" instead of "*Carpentry and Building.*" — EDS. AMERICAN ARCHITECT.]

NOT THE ARCHITECT OF THE PLAZA APARTMENT-HOUSE.

NEW YORK February 24, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — You did me the honor to publish in your journal of July 5th, 1884, my design for the then proposed Plaza Apartment-house — Fifth Avenue, Fifty-eighth and Fifty-ninth Streets in this city. That design was not carried out, and as I do not wish to be credited with the work of another, I will esteem it a favor if you will mention that I am not the author of the building as executed.

Yours very truly, CARL PFEIFFER.

THE TORONTO COURT-HOUSE COMPETITION.

BUFFALO, N. Y., March 1, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Intending competitors for "Toronto Court-House" may be glad to learn what has not been generally recognized, though made public, viz.: —

(1) The condition as to experts on jury before resulted in the experts declining to serve with the court council, who at once relieved them and appointed three political "worthies" "whom they could relie on" and *themselves* as a "*final*" *tribunal.*

(2) Though more than fifty designs were in, *each* requiring, at a low estimate, forty-eight hours' work of a skilled quantity-surveyor, to verify it — the "trio," wrote, *inside of three days from appointment* (if I remember rightly), that they had examined each with great care as to quantities, prices, etc. (or words to that effect), and were "certain none could be built" within the amounts (*vide* Toronto papers).

(3) The identity of authors was *not* concealed.

(4) The "motto" condition is simply a farce now that a revision only of the old designs is asked.

(5) Seven designers were reported to have approximated closely the requirements. It is manifestly unjust to them to reopen the competition after their ideas have been made public (but not premiated) for others to use.

(6) The intention of withholding prizes from all but low-cost designs, and thus trying to avoid all prize payments, was not made public until designs were about finished.

I trust you will expose what was one of the worst "fixed" political jobs the "Dominion" has seen.

Yours truly, NOT "ONE OF THE SEVEN."

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I enclose a circular having reference to the Toronto Court-House Competition, from which may be gathered the action taken by the authorities up to the present time. As the author of one of the seven reserved designs spoken of, I received this circular yesterday. Will you publish, in your next issue, a request from me to the other six to communicate with me at once with a view to united action of some sort. It might interest your readers if you reprinted the entire circular, but that I leave to your own judgment.

Yours faithfully,

A. H. JAMES.

TO THE COUNCIL OF THE CORPORATION OF THE CITY OF TORONTO: —

The Executive Committee beg to submit their Report No. 2:

Your Committee have had before them Report No. 1 of the Court-House

Committee, and the same is herewith submitted for the consideration of the Council. Respectfully submitted,

D. M. DEFOE, *Chairman.*

Committee Room, Toronto, February 3d, 1886.

REPORT NO. 1 OF THE COURT-HOUSE COMMITTEE.

In presenting their first Report dealing with the erection of the proposed new Court-House, your Committee beg to state briefly what steps have been taken in the matter by their predecessors for the information of the members of the Council.

In the latter part of 1884 instructions to architects were prepared by Mr. W. G. Storm, under the direction of the Court-House Committee of that year, giving a general idea of the accommodation required in the proposed building, together with all other necessary information required to enable architects to prepare and submit competitive designs. In response to the circular issued, fifty sets of plans were received. The Committee thereupon appointed Mr. Alexander Manning, then Mayor; Mr. Thos. Fuller, Government Architect, and Mr. Matthew Sheard, Architect, as experts, to examine and report on said plans.

They reported to the Committee in August last. The following extracts embody the recommendations of importance contained in their Report:

"Clause No. 3 of the circular, March 4th, 1885, is 'That no prize be awarded to any plan the carrying out of which will exceed $200,000. After several very careful examinations of the various designs, we have to report that the greater proportion were found to be so defective in general arrangement and deficient in light, etc., and so unsuitable in exterior and interior design as not to be worthy of further consideration; and of the balance, though many exhibited much thought and skill in the arrangement of the various courts and offices, and as regards the exterior, and bore evidences of considerable artistic skill, yet there were serious objections in the grouping of some of the departments for the transaction of business, and for obtaining light and air (two very important features), and as there was not one suitable design the carrying out of which would not greatly exceed $200,000, we are prevented by Clause No. 3, from making any award of the premiums, and we further found that under any circumstances there was not one design which we could recommend for adoption in its entirety.

'As we cannot advise the adoption of any design in its entirety, and as by Clause No. 3 we are unable to award any premiums, we consider that all plans and specifications should *at once* be returned to the various authors without being made public; and that the authors of the seven which, irrespective of cost have, as regards the arrangements, most closely adhered to the requirements, and whose elevations are of the most appropriate character, be invited to prepare amended designs to be submitted, say four weeks from date of invitation, on the following conditions:

'Plans drawn to a scale of one-eighth of an inch to a foot, to consist of the following: four elevations, two sections, plans of each floor, plan of roof, perspective at option of competitor, also a brief description of the various materials proposed for the construction."

Owing to various unforeseen circumstances, the Committee of last year were unable to make further progress, and your Committee, upon assuming office, find matters standing in this position. At their first meeting after organization, a sub-Committee was appointed, consisting of Ald. Hastings, Defoe, and Walker, to confer with the Judges and Court-House officials, with a view to ascertaining what modifications could be made in the instructions prepared by Mr. Storm. As a result of such conference, considerable reductions in the size of many of the offices and rooms have been made, which will materially reduce the cost of the building.

Your Committee would therefore recommend that the plans be returned to their respective authors, and that they be informed that it is the intention to have new instructions prepared, showing the modifications proposed, and that the said authors be invited to send in new plans, the competition being confined to them, the author of the plan selected by the experts to be hereafter appointed to be entrusted with the carrying out of the work at the remuneration of 4 per cent commission on outlay, and that a premium of $500 be given to the next best plan, $300 to the next best plan, and $200 to the next best plan.

Your Committee would further recommend, in the event of the foregoing meeting with the approval of the Council, that the work of preparing the amended instructions be entrusted to the sub-Committee above named, together with Ald. Galley and Hunter, said sub-Committee to have the authority, if they deem necessary, to call in professional assistance. Respectfully submitted,

THOMAS A. HASTINGS *Chairman.*

Committee room, Toronto, January 29th, 1886.

Adopted as amended by City Council of Toronto, February 8th, 1886.

W. A. LITTLEJOHN, *Assistant City Clerk.*

Scarcity of Black Walnut. — Canadian lumber-dealers are now glad to buy the black-walnut fence-rails which farmers split and used as they would any other timber twenty or thirty years ago. The long exposure has seasoned the wood thoroughly, and it is valuable as material for chair-legs, spindles, and other small articles. — *Philadelphia Press.*

TRADE SURVEYS

This week's reports from all cities as far west as Minneapolis and Kansas City, and as far south as Chattanooga and Savannah, are of an exceptionally gratifying character. Along the South Atlantic coast there are indications of a general activity in shipping interests, lumber, and manufacturing interests as well as in agricultural interests. The exodus of the negro population which has been arrested for a time will likely set in again, but the disadvantages, such as they are, are likely to be offset by the arrivals of Northern laborers, skilled and unskilled, and by the introduction of machinery, not only to economize shop, but also field labor. Building operations will also be actively prosecuted throughout the Carolinas, much of it stimulated by Northern capital and directed into manufacturing and lumbering channels. Leading lumbermen are in North Carolina this week from Philadelphia and New York, with instructions to report desirable timber-land bargains. In Chattanooga there are agents of Pennsylvania capitalists at present engaged in selecting a site or sites for enormous steel-works. Several enterprises are also projected there of a manufacturing character. Chattanooga has grown more rapidly in five years than any other city in the United States, and is attracting a great deal of notice in developing interest among manufacturers both in the North and abroad. The published reports of building operations in several of the Southern cities do not convey a complete impression as to the real magnitude of the pending and projected industrial and building operations. Capital and emigration has encountered an obstacle in the Rocky Mountains in the West, and is therefore obliged to head southward where vaster opportunities are awaiting them. In the larger cities west of the Mississippi extraordinary preparations are being made for the prosecution of building enterprises, and greatly increased investments will be made in the most desirable localities. The railroad wars are working an indirect benefit in making it desirable for persons of small means to make a start in this new region where coal, lumber, labor and transportation, for short as well as long distances, are relatively cheaper than in the farther East. The same general tendencies are apparent in the Northwest, but the enterprises there are of larger proportions, and are confined more largely to railway construction, bridge-building, elevator-work and speculation in lumber, and ore and agricultural and mining lands. Speculative movements, however, in lumber are not confined to that locality. Capitalists have purchased extensive white-oak timber-lands in richly wooded sections of Mississippi with a view of immediately utilizing that timber for cooperage stock for export. The increasing demand for lumber is naturally creating a speculative movement, not only in the Northwest, but also in the South, and an enormous amount of alleged timber-land is being thrown upon the market, much of which is of uncertain value. No doubt, we are upon the eve of a speculative era in lumber. This is indicated by a movement to put lumber on the free list, a movement which is not endorsed by many of those who are supposed to be benefited by it, viz., the dealers and consumers. Large tracts of Canadian lumber territory have been purchased within a few years, he owners of which believe that, if the duty of $2 could be removed, an enlarged market would be developed in competition with the American woods. A few days will inaugurate a demand for lumber of all kinds in all markets. The announcements of permits taken out and building operations undertaken in several of the large cities during the past week show that we are about entering upon a very active building year. It is gratifying also to note that real estate is appreciating in value, not only in the business centres of cities, but also in suburban localities. This fact tends to stimulate business enterprise rather than discourage it, provided the growth be a healthy one, as it undoubtedly is in the present instance. Not only are architects and builders and owners of real estate surprised at the steady demand for house-room, but also persons who call themselves political economists. The wonderful production of wealth that has been going on for a generation or two is showing results in a new direction, in the better housing of the millions. Reference has been heretofore made to the great field for capital and enterprise that exists in meeting these demands. The manufacturers of all kinds of material are beginning to recognize the full force of this movement, and it is this knowledge which is the motive power behind the hundreds of new manufacturing enterprises springing up. We have had bitter lessons in over-production, and for years past manufacturers of all kinds have been keeping a sharp eye on the possibility of a reaction and depression. To all appearances, no reaction like those through which we have passed is likely to occur so long as the productive masses of the country can be maintained at its present limit. The iron trade holds up well. The steel-rail makers have contracts for a million tons on their books. The merchant-steel makers have begun to gather their spring crop of orders. Within two weeks orders for something over 2,000 freight cars have been placed by the trunk lines and some of their Western connections. Prices are very firm in all kinds of material, and in crude iron a further advance seems extremely probable. Skilled and unskilled labor is being advanced in price and attempt of organized labor to reduce the number of hours of the working day is likely to meet with success. The benefit of this movement will be discounted so far as increased earnings are concerned by an advance in cost of living, house-rent, etc. The change will work no permanent harm to the building and manufacturing interests as the advantages and disadvantages will be pretty equally and silently equalized. The substantial advantage that labor will secure will be more leisure, whatever labor may make out of it. So far as builders have been heard from they report no material advance in prices, but an advance is not at all out of the way by midsummer. Within sixty days the actual character of the year's business can be very correctly summed up, and the probable effects of the higher price of labor can be discounted. In New York city builders and architects are extremely busy, and in Philadelphia the announcements have been made of the projected construction of between seven and eight hundred houses within a week. In Western Pennsylvania building activity will exceed that of last year; but the chief interest centres in the accumulation of manufacturing capital and the growth of enterprise, because of the exceptional advantages of natural gas. A company has been incorporated to carry gas to Philadelphia, and a line will be built within sixty or ninety days to Johnstown, seventy-nine miles east of Pittsburg. Several other lines are talked of, and contracts have been let for the construction of about one hundred and fifty miles, for which material has been already called for. The anthracite-coal combination has not yet come to terms with itself. The bituminous-coal pool is taking advantage of the inharmony and expects to double its shipments to New England markets this year. Last year the shipments were about 500,000 tons. Freight rates have been reduced to $1.40 from the mines to competitive points in the East. There seems to be but little likelihood of any permanent advance in anthracite because of this competition as well as the competition of the anthracite companies themselves. The bituminous operators and miners in the West have come to terms, and as a result an advance in the selling price of soft coal of from ten to fifteen cents per ton is looked for. All these favorable industrial conditions bear very intimate relation to the healthful activity of building enterprise.

Prairie-Dog Wells. — A Nebraska man has settled the question of how prairie-dogs obtain the water they drink. He says they dig their own wells, each village having one with a concealed opening. He knows of one such well 200 feet deep, having a circular staircase leading down to the water.

The American Architect and Building News.

Vol. XIX. Copyright, 1886, Ticknor & Company, Boston, Mass. No. 533.

MARCH 13, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

THE *Inland Architect* thinks that we made a mistake the other day in advising a correspondent, who wanted to know how to collect a bill for services, to take his notes and time-book to his debtor, and show him how much work he had actually done, representing to him also the value of the professional responsibility involved in drawing up his plans and specifications, in order that his debtor might see for himself the justice of the claim. According to the *Inland Architect*, the regular schedule should be maintained as the inviolable basis of professional charges, and any attempt to question it, or to set it aside for the purpose of valuing an architect's time by the hour, ought to be resisted by the united influence of the profession. Now, although we are quite ready to acknowledge that we sometimes make mistakes, we cannot, on reviewing our remarks on the occasion in question, persuade ourselves that we ought to have given a very different answer to the question asked of us. Our readers may perhaps remember that the charge which our correspondent wished to collect was less than that authorized by the Institute schedule, and as he had thus voluntarily deprived himself of the support of professional and recognized custom, there was nothing as it seemed to us, for him to appeal to in support of his claims except some sort of proof, which an unprofessional man could appreciate, that he had earned the money by the expenditure of a given amount of time on the part of himself and his subordinates, valued at a reasonable rate.

WITH regard to the regular scale of charges, although we feel quite as strongly as the *Inland Architect* the importance of maintaining it inviolate, we cannot quite agree with our contemporary in thinking that its value as a standard is likely to be injured by comparing it occasionally with a measure of compensation derived from an estimate of the value of the actual work of the architect and his assistants at so much per day or hour. The *Inland Architect* says, truly enough, that the value of a professional man's work is not to be judged by the time that it takes, since one man may concentrate into a few minutes' labor as much thought and skill as another would be able to display as the result of a week's toil; and in disputes with regard to the schedule charge for sketches, we think that this point is of the greatest importance; but an architect's complete service is made up of an infinity of small details of thought and labor, the aggregate of which does not vary much among architects who understand their business, and carry it on faithfully; and it has long been conceded in all parts of the civilized world, that five per cent on the cost of a building of importance is a fair remuneration for the skilled labor and responsibility required of the architect. How long the struggle may have lasted between architects who wanted more, and the public which wished to pay less, before this compromise was generally agreed upon, we cannot say, but it has been for so many generations universally accepted, that it has come to have the force in law attaching to an ancient and well-known custom. More than this force it has not, and although Institute-schedules are of value in giving details of such methods of dividing professional services and fees as are generally found acceptable, their sole force, so far as the public is concerned, comes from the fact that they give expression to customs so ancient and reasonable that, in the absence of other evidence, they are commonly regarded as forming the proper basis for calculating compensation for professional work. This view of them prevails in courts as well as among the community in general, and the custom, so sanctioned, and so long established, is of great value to architects in saving them from spending half their time in haggling and dickering over their bills, which are sure to be brought up later as evidence to contradict the custom, perhaps to the serious detriment of men who have more than earned the proper fees by skilful and conscientious labor.

IF, however, it should appear that an architect had obviously done little or nothing to earn his fee, or if the schedule charge should be, as might possibly happen, plainly out of proportion to the service rendered, it would be useless for him to rely on the schedule for enforcing the payment of the full commission. The *Inland Architect* thinks that no one should be permitted to go behind the schedule, to use a politician's phrase, but it is certain that a court would go behind it without hesitation if there seemed to be occasion for doing so. "I will not hear of such a basis," said the Lord Chief Justice Coleridge, when an architect appeared before him with a claim which, as he said, he based upon the Institute schedule. "No body or society," his lordship continued, "has any right whatever to fix its charges at certain sums, and say they are to be paid;" and there is no doubt that any judge would say the same, and would, as Lord Coleridge did in this case, reduce the dispute to the question of how much the architect had fairly earned. That in at least nine cases out of ten, where architects' fees are concerned, the jury finds that the usual fee of five per cent on the cost, for the larger class of buildings, is a proper and moderate one, shows that the schedule represents what most people believe to be a reasonable custom; and since it is from this fact that it derives its authority, we should, as it seems to us, instead of relying upon it blindly as a code which can be enforced upon other persons than ourselves, take pains both individually and as associations, to gather evidence in the shape of time-books and memoranda, which may, in time of need, be found extremely useful in defending the schedule which we so often have occasion to rely upon for defending us.

WE have received several communications in regard to the competition for the Toronto Court-House, with requests for some expression of opinion on our part which might, as one of our correspondents says, be of assistance in inducing the City Council "to deal with the matter in an honorable way." While the competing architects have our sincere sympathy in their efforts to secure the literal fulfilment of the terms of the invitation by which they were induced to go to the trouble and expense of preparing plans, we do not feel that we possess a sufficient knowledge of the matter to make our opinion upon it of much value to any one. Our impression has been from the first, that most of the members of the City Council desired to use only fair and honorable means for obtaining the best possible design for their building, but that their good intentions had been to a certain extent frustrated by the activity of one or more of those ignorant busybodies who make themselves of so much importance in affairs of public concern; and we are still inclined to think that the architects interested, by making a firm and unanimous demand for their rights, will be able to enlist upon their side the best portion of the City Government. Our readers will remember that we remarked at the time when the first invitation was issued, that some officious individual in the Council seemed to have had influence enough to secure the insertion in it of provisions quite contrary to the fair and honorable spirit in which it seems to have been originally devised. It is to be regretted that any architect should have been found to accept the invitation until its objectionable portions had been abandoned, or modified to accord with the code of ethics universally received in the profession, and the

present struggle for fair treatment will be made much harder by this preliminary slip, but it is never too late to mend, and the competitors have now at least an opportunity to regain their self-respect, and the respect and support of their fellows, by a determined effort to secure justice.

THE response made to our invitation for designs for a $5,000-house has been in every way satisfactory, as rather more than fifty designs reached us from all quarters of the country before the expiration of the appointed time, and the average merit of the work compares favorably with the best of the domestic work now done, where the money at command compels a certain suppression of the national weakness—a tendency to exuberancy and senseless multiplicity of parts and motives: some are, in their refined simplicity, all that a man of sensibility could ask; most aim at picturesqueness before all else — and some attain it; while not a few have succeeded in being American in their treatment above all things, notably in the plans. The drawings are now in the hands of a builder who is noted for the thoroughness with which he prepares his estimates, and we hope that before the patience of the competitors has been worn threadbare, he will have completed the tedious task he has provisionally undertaken, and that then the drawings can be submitted to the jurors, and publication of the most noteworthy begin. We think the experiment of having all the designs "figured on" by the same builder likely to add considerable interest to the competition, but it seems likely to be such a time-consuming process that we question whether future competitors will care to have us make this course a permanent condition of our programmes.

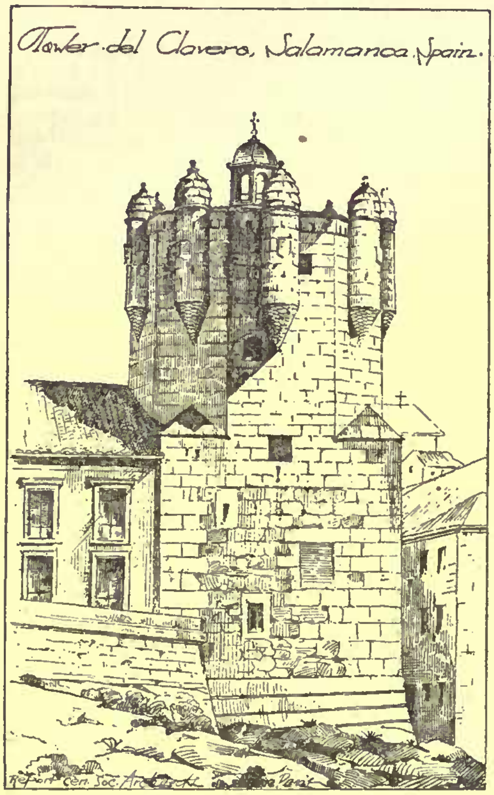
WE have long thought it strange that some one should not have investigated the effect upon health of the dry-rot spores which fill the air of many inhabited rooms, and we are consequently not much surprised to find in the *Berlin Bautechnische Monatschrift* an article the head-line of which announces that dry-rot has been discovered to be "a deadly poison." The facts on which this opinion is founded have a very considerable interest. It seems that in July, 1877, a school-master in Eastern Prussia called in a physician to attend his nine-year old son, who had been attacked with a disease closely resembling typhoid fever. About a week afterward another son was attacked in the same way, and within a fortnight subsequently two other children and their mother were prostrated with similar symptoms. The physician expected to find the origin of the disease either in some contagion, or in polluted drinking-water; but no other fever-patients were anywhere in the neighborhood, and the drinking-water used by the family was found to be pure. On making further investigations the physician observed that both the school-houses, in which the three older children slept during the summer, and the teacher's house were pervaded by a musty, disagreeable smell, and the furniture and books in the school-room he found to be powdered with a reddish-yellow dust, which, when examined with a microscope, was recognized as being composed of spores of the merulius lacrymans, or dry-rot fungus. The sheathing around the room was then torn away, and a luxuriant growth of dry-rot was found behind it. The workman who pulled down the wainscot was taken sick, but soon recovered.

THIS singular attack becoming known among physicians, one of them was sufficiently interested in the subject to look for accounts of similar cases in medical periodicals, and he discovered an article in *Hufeland's Journal* for 1826, in which was described an attack of precisely the same kind, in which a woman and her three children were siezed with the same sort of low typhoid fever, with headache and delirium, in a house where the woodwork was affected with dry-rot. Two carpenters' apprentices were employed to tear away the wainscoting, and were attacked with the same disease, but more violently, so that both died, one after four and the other after eight month's suffering. In the case of these two the last stages of the disease were characterized by swelling of the neck, while the mouth and throat were filled with a white growth, which the account compared to the aphthæ or thrush of infants; and boils broke out at the last on every portion of the body. These two cases occurring fifty years apart would seem to furnish a rather slender foundation for a theory, but Dr. Poleck, of Breslau, in studying them, was struck by what seemed to him a similarity between the symptoms and those of the new disease first described in 1878 under the name of actinomycosis. Actinomycosis is an infectious disease which was observed in domestic animals, particularly in cattle and hogs, before it appeared in men, and, like all other infectious diseases, is believed to be communicated by spores or microbes of some sort, although the spores have never been identified outside of the body. When taken into the circulation, however, either through the lungs or stomach, the spores develop, after a period of incubation, with swarms of clustered bacteria, characteristic of the disease, which soon invade every portion of the body, corroding the bones and choking the blood-vessels. It is found that these microscopic bodies, when isolated, are composed in great part of phosphate of lime, and as the disease, which, in domestic animals is vulgarly known as "jaw worm," usually first attacks and disorganizes the bones of the head, it is supposed that it requires the phosphoric acid of the bony substance as nourishment in order to develop itself. Singularly enough, the dry-rot fungus also flourishes best in the presence of phosphates of some kind, and although the star-like clusters of the actinomycetes differ very widely from the long, creeping threads of the dry-rot mycelium, the process of development of the merulius from spores is attended, in one stage, with the production of bodies which, as shown in the plates of some recent works on microscopy, exactly resemble those which choke the veins of patients suffering from actinomycosis. From these considerations Dr. Poleck is led to believe that there may be some close relation between the two parasites, and it may be admitted that his opinion has some plausibility. Whether it should be confirmed or not, it is certain that further research into the effects of dry-rot on the system would be well repaid. So many diseases are now known to be attended, if not caused, by the rapid development in the body of fungoid growths that the inhalation or swallowing of the spores of fungi may be presumed to be generally attended with some risk; and the growth of the merulius, which often sends its mycelium threads many feet, and through heavy walls, to develop into great plates of mushroom-like substance wherever it meets a supply of suitable food, is so rapid and energetic that it might well become a parasite of the most dangerous character if it should happen to find conditions favorable for its development within a living body.

A CORRESPONDENT of the *Builder* tells a rather interesting story about the architects of the Church of the Sacred Heart at Montmartre. This immense and costly building, now nearly up to the cornice, was begun from the design of M. Abadie, which was chosen in a competition in which seventy-seven architects engaged. For some years Abadie carried on the work, but the foundations, which were enormously costly, had hardly been completed before he was taken sick, and he died before the building was ready for the first floor. Before his death, he named M. Daumet as the architect whom he would like best to finish the work which he had begun, and the authorities in charge of the building complied with his wish, and appointed M. Daumet to succeed him. Abadie's plans were complete, and it would have been easy to carry them out with literal exactness, but M. Daumet had some ideas of his own, and prepared a set of modified drawings, in which the walls were made fifteen feet higher than in Abadie's design, the windows around the apse were enlarged, and changes were made in the form of the domes and the clock-tower. Before he had had an opportunity to carry out these modifications, a rumor of them got abroad, exciting a considerable stir in the local architectural world. The Archbishop of Paris sent orders to suspend at once all work upon the building, and a jury, composed of Messrs. Bailly, Vaudremer and Garnier, was invited to examine M. Daumet's modified plans, and report upon the advisability of having the building carried out in accordance with them, instead of M. Abadie's original project. The jury returned a report in which, although expressing the highest regard for M. Daumet's learning and ability, they recommended that no change should be made from the original designs. It seemed to them that the modifications proposed were unnecessary, and that M. Daumet, as the artistic executor of M. Abadie's will, was bound to carry out his plan faithfully, unless some change should be obviously needed. M. Garnier added that, to his mind, Abadie's design was superior to M. Daumet's version, but the others seem to have contented themselves with laying down a general rule of professional ethics, which must be admitted to be a good one.

STROLLS ABOUT MEXICO.[1] — XI.

FROM LAGOS TO ZACATECAS.



Tower del Clavero, Salamanca, Spain.

LEAVING Lagos, the train soon begins to toil slowly up out of the valley, commanding broader views over the sunny expanse, generally brown, but, when I last saw it, of a delicate refreshing verdure under the summer rains. The two towers of the church stood proudly up, and the lakes round about, which give the city its name, glistened in the sunlight like sheets of metal.

About two hours beyond Lagos we come suddenly upon the great iron bridge spanning a deep ravine near Encarnacion, the preparations for building which delayed the construction of the railway for several months. It is the highest and longest bridge in Mexico. It was preceded by a temporary trestle-work of wood, that was so "skittish"-looking that the locomotive engineer could not be persuaded to start his engine when the first train was ready to cross it, and so General Manager Fink, who designed it, took his place at the throttle and carried the train across himself.

From the station near the bridge a tramway runs curving down the steep slope into the City of Encarnacion, lying snugly in the depths of the ravine, two or three kilometres away. I noticed that the long street by which we entered the city bore a continuous name, and the houses were numbered in the American fashion, odd on the right and even on the left. I was told that this was the custom in the State of Jalisco, whereas in the City of Mexico and other cities in the central part of the republic, a thoroughfare bears a different name for every block, and the numbering is done according to some system which might be called occult, for I never could comprehend it.

Encarnacion de Diaz is the name of the city, it being the custom with many Mexican cities to couple the name of some patriot with the proper name of the place. Thus, for instance, we have Oaxaca de Juarez, Dolores de Allende, Cuautla de Morelos.

It was the first of December at the time of our visit, and the rose season was at its height. The little Plaza garden, enclosed by a handsome wall of brick and open-work of tiles, was literally a sea of roses; the billows of bloom obscured the ground, and the air was heavy with the rich fragrance, so that I had some idea of what a Turkish rose-garden must be like. The parochial church opposite was a handsome edifice, with one of its customary two towers still in the course of construction.

About an hour more brings us into the City of Aguas Calientes, the capital of the State of that name. Aguas Calientes means "hot waters." Just before the train stops at the station it crosses a broad avenue, arched with great trees, leading out to the hot springs some distance to the eastward. Beside this avenue there runs a considerable ditch walled with masonry, in which a considerable stream of clear water runs—the waste from the springs conducted in to irrigate the gardens and fields around the city. Beside the ditch there runs a covered conduit of brick bringing the water for the extensive warm baths in town. In the ditch may be seen scores of people enjoying the luxury of a free warm bath at all times of day, and on Sunday it is dotted with heads the whole length of the avenue. The bathers are universally Indians, and the sexes bathe together with no thought of immodesty. Whole families are frequently seen in a group, squatted in the water up to their necks, soaking and chatting for an hour at a time. Perhaps they make up bathing-parties, just as fashionable people with us get up theatre-parties.

I have spoken of the water in the ditch as clear; it is normally so, but as the pool out at the springs is the gathering-place of the washerwomen of the city, and as many of the bathers use soap, the current is generally during the daytime, pretty opaque with suds by the time it reaches the railway track.

The baths in the city are luxurious in their appointments, and are surrounded by a charming garden, but they are not so warm as those out at the springs themselves, where the water gushes up strongly out of the sandy bottoms of the bathing-apartments at a temperature considerably over blood heat. There is a separate spring for each apartment, over the door of which is painted the spring's name, a name conferred in honor of some saint; the respective degrees of temperature, which differ slightly, are also designated. The baths are commended as very efficacious for malaria, rheumatism, and various other diseases, although the analysis shows no special mineral qualities. It is claimed by some authorities, however, that the virtues come from a magnetic condition inherent to the water, though how, I cannot understand.

As Aguas Calientes is the headquarters for several departments of the railway, there is a considerable American population in the place, and the character of a portion of it is indicated by the group of frontierish-looking rough board shanties, cheap restaurants, drinking-saloons and the like in the neighborhood of the station, so we are glad to escape the disagreeable place by taking one of the two tramway lines for the centre of the city. The spirit of competition struck Aguas Calientes with the coming of the railway, and the result was the building of two tramway lines, a broad and narrow guage respectively, so that fares were down to three cents.

The vicinity of the railway station was the only disagreeable feature I could discover about Aguas Calientes, and even that was mitigated by the handsome avenue just described. Aguas Calientes is one of the places which charms one at the outset, and the charm is lasting. Its climate is as near perfect as could be desired. Even those inveterate grumblers, American railway employés resident in a foreign land, confessed that they could find no fault on that score, and a sturdy Californian whom I met was so disloyal to his own State as to exalt Aguas Calientes in this respect above the proverbially "glorious climate" of the Pacific coast. The pure, dry air, the equable temperature, with no extremes of heat and cold, and varying little between winter and summer, together with the attractions of the hot springs make the place a natural sanitarium. It would be difficult to find a more favorable resort for persons with weak lungs. My attention was called to the great number of vigorous-looking old people to be seen. "Folks don't die here; they simply dry up and blow away," I was told.

It is a cheery, substantial-looking city, with beautiful gardens and clean streets. It was a pleasure to walk upon the smooth sidewalks, paved with small hexagonal tile, hard and red. There were two delightful public gardens, the larger being the Jardin de San Marco, and the other that of the main plaza. In the midst of the latter, faced as usual by the parochial church, rose a tall Doric column, with four marble swans at the corners of its base, spouting streams of sparkling water out into a large stone basin. The trees about stood in what might be called foot-baths of masonry, to collect the water when in the dry season irrigation was necessary. Around the square was a broad double walk for promenaders, the outside part tacitly devoted to the plebeians, while the patricians used the inside, at the frequent concerts given there by the band of the Federal troops stationed in the city. On one side of the plaza stood the State palace, the façade of which was frescoed after a fashion which in design and hues would seem to indicate the consequences of nightmare or delirium tremens on the part of the artist. Just off the plaza stood the new theatre, then building, which promised to turn out excellently in point of thorough construction as well as good design. The old theatre in the neighborhood spoke well for the climate, for it was roofless; a quaint place it was, with a long entrance passage that rambled in through buildings and courts to a stone amphitheatre, with the front row seats of the tier separated by stone arms. It was formerly a cock-pit.

A peculiarity of the local ecclesiastical architecture was the prevalence of belfries consisting, instead of towers, of a series of arches in a single wall, often built at the corner of the building. This feature comes from Spain, but is infrequent in more southerly parts of Mexico. I observed that the façade of one of the former convents was of Gothic design. Mr. Jackson, of Denver, found the subjects for some of his finest Mexican photographs in Aguas Calientes. A more thorough picture could hardly be desired than his view of the market: a stone arcade in the foreground, rich in shadow, with the figures of natives in their costumes grouped about, the broad space beyond flooded with sunshine, and the domes and belfry of the San Diego Church in the background; these features framed in by three arches. Another view shows the fascinating irregularity of the same church, as seen from the roof of the market. [*See Illustrations.*]

The foundation of the prosperity of Aguas Calientes is the rich agricultural country surrounding it, and as we speed northward by rail we pass through expanses of grain that would do credit to any of the great agricultural States of our American Union. The long valley filled with these fertile fields, continues with a north-and-southward trend until we draw near to the great mining city of Zacatecas.

We first made the tortuous passage over a rugged range where the rarified air, even at mid-day, strikes cool through the car windows, and then we looked from the farther slope away across such a vast, sunny reach of landscape as can be seen in few places as on the Mexican table-land. It seemed as if the valley stretched away to the distance in the east until it was almost closed by the curvature of the earth. Nearer at hand, but still a dozen miles away, and seen with remarkable distinctness, the line of the track, in alternate curves and tangents, disappeared in a ravine out of which a foam-like mass of

[1] Continued from page 79, No. 529.

buildings seemed tumbling, like a tumultuous torrent. The peculiar looking fort-like structures scattered about the long slopes and on the hillsides indicated a mining region. The place in sight is the city of Guadalupe, a populous suburb of Zacatecas.

The passage along here is the most picturesque portion of the whole Mexican Central Line. The valley is narrow and the line twists ascending along its westerly side until we look down into Guadalupe almost as if from a balloon. Down in the depths of the valley, following the course of the little river, is another railway, a detached section of the Mexican National Line built from Zacatecas to Guadalupe and a little beyond. Its cars runs by gravitation from the starting-point in the heart of the City of Zacatecas down into Guadalupe, and are hauled back by mules. The intention is ultimately to build to San Luis Potosí.

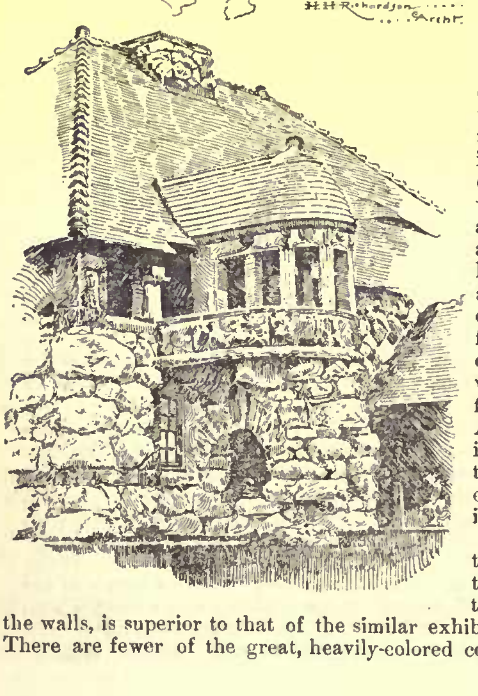
Our train runs along the shelf on the steep slope, twisting in and out, through some heavy rock cuttings, but just avoiding the necessity of tunnelling, thus making the remarkable record of a railway over twelve hundred miles long, through one of the most mountainous countries on earth, built without a single tunnel. There are mines about us on all sides, above us, and even below us, for in one instance the track runs directly over the mouth of a shaft, and some of the cuttings are through low-grade silver ore. At last we come in full sight of the large City of Zacatecas filling up the rambling valley beneath us, and rising up to the railway station where we stop, the second highest point of the line, over 8,000 feet above the sea, and on the exact water-shed between the Atlantic and Pacific. There is a lively bustle at the station, for Zacatecas is one of the busiest cities in Mexico.

Tramway-cars plunge from the station down through the tortuous streets into the heart of the city, which in situation and general appearance closely resembles Guanajuato in many respects, though not so beautiful and attractive as the latter city. Its climate is harsh, considering that it is in Mexico, and within the limits of the tropics, its great altitude making it liable to sudden changes and much chilly weather, with occasional snows in winter. My first visit, however, was attended by weather that left little to complain of; although it was December the sun was shining hotly through the clear, thin air, and the gardens were full of bloom. But at nightfall there came a sudden chill; the heat went out of the world with the departing of the light.

Among the notable features of Zacatecas are the cathedral with its richly sculptured façade and the great cliff of La Bufa towering almost directly overhead, the principal hotel, El Zacatecano, which was formally a monastery, and the river with a narrow channel, which is rapidly becoming subterranean, the lack of elbow-room in the city and the demand for further buildings causing them to arch over the river bed at frequent points and build thereon. The aspect of the irregular buildings abutting over the stream would delight Whistler or Pennell, and I can fancy the place fitting well into the latter's delightful etchings of the Tuscan cities.

Zacatecas is a rival of Guanajuato as a producer of silver; the present output being about the same, as well as the immense amount of treasures which the two cities have turned out from their mints in times past. Some of the great mines are directly beneath the very centre of the town. SYLVESTER BAXTER.

THE BOSTON EXHIBITION OF ARCHITECTURAL DRAWINGS.—I.



THE example set by the New York architects has already been followed by their brethren in Boston, who have had enterprise enough to offer to the public an exhibition containing nothing but architectural drawings, and notwithstanding the absence of other attractions, the collection is as pretty and interesting, even to the unprofessional visitor, as one often finds anywhere, and the well-filled gallery of the Art Club, in which it is shown, indicates that public appreciation is not wanting.

Taken as a whole, the appearance of the Boston collection as hung upon the walls, is superior to that of the similar exhibition in New York. There are fewer of the great, heavily-colored competition perspectives, and fewer, also, in proportion to other kinds, of black-and-white work; so that the general effect is one of delicate color, sepia, brown ink; tinted paper and sketchy washes giving the prevailing tone, upon which an occasional black-and-white sketch, or a drawing in full color, count like the high lights and deep shadows of a well-balanced picture, instead of fighting for supremacy with each other.

It seems a little formal to take up the drawings one by one, but, with two hundred and six to consider, it is difficult to do otherwise without forgetting some one of the many which ought to be noted for the example presented in them of one sort or another of special excellence. A collection of architects' sketches always has a certain interest in the variety of treatment which it shows. Some men succeed better in color, and some with ink, and nearly all have tried several methods of getting effect, the results of which convey to their fellows encouragement or warning, as the case may be; so that for the young architect or student, himself uncertain as to what style to choose, the opportunity to study the experiments of others is of great use.

The first number on the catalogue, which, by the way, is a remarkably handsome, straightforward piece of work, enlivened with fifteen process-plate prints of some of the best sketches, belongs to some very pretty sketches by Messrs. Hartwell & Richardson. Mr. Richardson, of this firm, is well known as a clever draughtsman, and his brown-ink studies are among the best shown. It is instructive, as showing the importance of practice in a given method of rendering, to compare these quickly-executed but brilliant bits of work with such drawings as No. 4, for instance, by Messrs. Chamberlin & Whidden, showing an interior in a hotel, which, although carefully done and constructed with due attention to the vanishing-points, is stiff and ineffective, although both the gentlemen whose names it bears have conspicuously good drawings in a different style in other parts of the room.

Near these sketches is hung an imposing set of geometrical drawings, rendered in the French style of conventional tints, and showing a design for a convent at Troy, by Mr. Thomas O'Grady, Jr. Although simple to the verge of asceticism, the design imitates so closely the dry Romanesque of modern French ecclesiastical architecture that one might easily mistake it for a *projet* of the Ecole des Beaux-Arts. In No. 8 we find a most amusing and characteristic pencil-sketch by Mr. W. R. Emerson, showing a bird's-eye view of a whole village of the picturesque houses in which he revels. Of course the houses are mere fancies, but there is an endless variety in them, and it would be hard to say which is the most delightful.

No. 9 is by Mr. John Calvin Stevens, of Portland, and, although not extremely interesting as a design, shows much cleverness in drawing. Near by, just beyond a good colored perspective, by Messrs. Burnham & Root of Chicago, is an extremely pretty and picturesque sketch of a country church with Sunday-school room attached, by Messrs. Peabody & Stearns. If anything, we should say that the design was a little too picturesque, the tower buttresses, for instance, showing an exuberance of growth rather out of keeping with the beautiful, quiet roof-lines; but, as in all Mr. Peabody's sketches, the drawing is so clear, and so thoroughly expressive of materials and structure, that we enjoy it more than many more elaborately-rendered works, and regret that the reproduction in the catalogue should do it such scant justice.

No. 23, in pencil, by the same hand, represents another church, better, if possible, than the other. The sketch looks like a bit direct from Normandy, and we can only wonder how an American church committee could have been persuaded into building anything so offensively "European" in style. Sandwiched between the two little churches are several color-sketches of country houses, also by Mr. Peabody, and delightful in every way. Mr. Stevens of Portland has near by a good pen-and-ink drawing of a church, showing very well studied detail, almost wasted, however, on a building which, through no fault of his, we are sure, could never be made picturesque or beautiful by any devices of art. Who it was that persuaded our uncles and aunts to abandon the respectable, and, to our mind, pathetic simplicity of the typical New England meeting-house, and replace it by the hideous combination of a largish tower on one side and a smallish tower on the other, and a flat gable between, that stares its vacant welcome on so many hundreds of church-goers on Sunday mornings, we cannot say, but if the execrations of architects could stir him in his grave, he would have no reason to complain of the quietness of his sojourn below ground.

Not far away, Mr. Earle of Worcester has another church, also suffering from the influence of the vernacular type; and close beside this we come upon two sketches which have a strangely familiar air. One of these, for a double cottage, is shown in a pretty drawing in common ink, by Mr. T. P. Chandler, Jr., of Philadelphia, and, as a drawing, is in his happiest vein; but the design has a singular resemblance to one published not long ago in one of the English journals. The other one, representing a library, by Mr. Lewis, we took at first to be a sketch of Mr. Richardson's building at North Easton, and discovered our mistake only to regret that the variations from the original had not turned out to be improvements.

The censorious mood, once provoked, is not easily put away, and we find a new object of criticism in a drawing by Messrs. Hartwell & Richardson, showing an elevation of their Odd Fellows' Hall at Cambridgeport, treated as a perspective. The same thing is seen in another of their frames, and the beauty of the rendering only makes the error of the treatment more apparent. We have an idea that

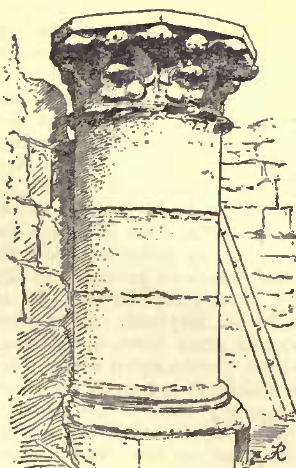
Mr. McKim was the first architect here to make this false and usually repulsive method of showing a design so attractive as to pervert the judgment of the more amiable class of critics; but he confined his attempts to slight though charming suggestions of a style of building which lent itself exceptionally well to such treatment. Carried only to the extent which he permitted himself, the effect is questionable, but when applied to a finished drawing, especially in pen-and-ink, the woodenness of the geometrical lines, as compared with the movement of a real perspective, becomes painfully apparent, even to those who care nothing for the small attempt at deception which they immediately detect.

On recovering from these reflections, we find ourselves attracted by a number of unusually good colored drawings, being near together. Three of these are visitors from New York, one showing a block of pretty and quiet houses by Mr. F. B. White, and another a similar block by Mr. J. B. Lord, both colored by Mr. Hughson Hawley, in his very best style. Mr. Hawley always seems, at first sight, to be a little over-fond of forcing the color of his buildings, or rather, we should say, of giving them a sombre aspect; but a more careful examination shows that this is done with a legitimate purpose, for heightening the beauty and transparency of his skies. Most beautiful and transparent they are, too, and if we cannot avoid the reflection that the architecture is a little sacrificed to them, we can still find instruction in noticing the skill with which, by the superposition of a dark chimney or finial, he transmutes a colored wash into the glow of a sunset sky, or fills his distance by the subtle application of a strongly profiled outline, with air and sunshine. The third stranger is Mr. Sargent's drawing of his rectory at Fordham, and a better model of a highly-finished color-sketch of a most worthy subject it would be hard to find.

Near the three New York drawings are two Boston ones, less finished, but in their way as interesting. One of these is an interior by Mr. Cabot, more attractive for its coloring than its architecture, and the second is a sketch of a house at Manchester-by-the-Sea, by Mr. Peabody, which strikes us as being among the best things in the collection. The drawing is on paper of a kind new to us, having much the tint of Harding paper, although somewhat deeper, and a smoother texture, the surface being ribbed just enough to prevent the drawing from having the washy look of a sketch on Bristol-board, but not so much as to destroy the firmness of the lines. On this material, one a pencil sketch, Mr. Peabody has laid a few well-chosen tints, and with the smallest possible amount of labor has produced a surprisingly effective drawing. As in all Mr. Peabody's perspective sketches, the angle of view, the height above the horizon, and the distance and position of the vanishing-points, are chosen with a care and judgment which we would commend to the attention of the authors of many much more ambitious drawing; and on the foundation so obtained he builds his effects of light and shade and color with confidence. Not with recklessness, let it be understood; every tint is mixed with the utmost circumspection, lest it should be too strong or too weak, or too dingy or too staring for its place in the work, and it is only through such preliminary care that he is able to lay, when his palette is ready, a set of tints which are in keeping from the outset, and do not need to be disturbed afterwards. Of course the strong color of the ground, which is everywhere more or less apparent, does much to bring the work into harmony, but a little carelessness, if he permitted himself any carelessness, would easily deprive him of this help.

[To be continued.]

PAUL BAUDRY.


Column found in the Hall of Philip Augustus, — at the Louvre.
(Rep. Gen. Soc. Architects. Paris)

THE principal characteristics of Baudry's life were energy, courage, and determination. Beginning his career with everything against him from a worldly point of view; struggling against poverty and privation, and sacrificing everything for the attainment of his object, he overcame all obstacles and obtained the success which he deserved. His disinterestedness and true ambition were shown by his eight years' studies for the decoration of the Paris Opéra *foyer*. Few artists would have given up so much time to such a work, knowing, as he did, that he could have gained ten times the amount paid him by the government (200,000 francs) by devoting himself to painting portraits and subject-pictures. But Baudry was made of exceptional material, and his ambition was not the sordid working for a fortune, but that higher kind, which stimulated the old masters to give up their whole lives to the perfecting of some one work which might be known to posterity. To do this successfully he felt that he must return to Rome and study still more effectively the great frescos of Michael Angelo and Raphael. Accordingly from 1865 to 1873, the Parisian world heard little of him. He passed some of his time studying the ceilings of Venetian churches and palaces, but most of it in making copies of parts of the Sistine chapel. Armed with these studies he returned to Paris and commenced the laborious work. That it is not as great as he intended it to be, is not his fault; he spared neither trouble, nor time, nor effort to render it so; and if he has failed, it is from want of originality, rather than from want of faith.

Paul Jacques Aimé Baudry was born in 1828 at La Roche-sur-Yon (Vendée). His father, an honest *sabot*-maker, found great difficulty in bringing up his thirteen children upon the profits of that industry; but Paul, showing some aptitude for music, was allowed to learn the violin, which enabled him early in life to gain a few *sous* by playing his instrument at weddings and fêtes in the neighborhood. Accidentally he became acquainted with Sartoris, professor of drawing at the lycée, who not only gave him some lessons, but recommended him to the *maire* as a fit subject for a pension. The municipality voted him 500 francs, and 300 francs more was added from private sources. With this enormous sum he started for Paris, where he entered the atelier of Michel Drolling, paying 25 francs a month to his professor. That Baudry was born with the spirit of self-denial is clear, for there are not many young boys of seventeen who would care to struggle on 70 francs a month; and still fewer who love art enough to sacrifice a third of that meagre sum for lessons! But the early history of most great men is the same — poverty, sacrifice, enthusiasm — the pure love of their work enabling them hopefully and cheerfully to bear the most terrible privations: Delacroix making his own frames; Flandrin dining off two sous' worth of fried potatoes on the Pont Neuf, and going to bed on a winter's afternoon to escape the chill of a fireless room!

"That which thy hand findeth to do, do it with thy might," is the true workman's motto.

In 1847 Baudry obtained the 2d Prix de Rome, and as a reward his native town augmented his pension to 1200 francs. The Grand Prix was awarded him in 1850, and he left Paris for the Eternal City. Here his natural bent of mind was fostered by the study of the great masters. Bouguereau was at the Villa Medicis at the same time, and some critics have pretended to find a certain similarity in the work of the two men; but Baudry's is far more vigorous, and wanting entirely in that graceful smoothosity — to coin a word — and prettiness, which is the chief element in the works of Bouguereau. That they both principally chose mythological subjects for their pictures, is the beginning and end of the similarity; for Baudry was *brutal* even, in his earlier work, and entirely wanting in the qualities of which his fellow-student had *de trop*. Most artists begin by representing too much detail, and are afraid of strong contrasts; but Baudry worked on the opposite plan, and became a detailist as he became older. Perhaps this was the secret of the advice I once heard him give to a beginner: "Seize the characteristics of your model, and even exaggerate them — commence by making a caricature, and then modify it as you go on." The great fault of his work is its modernness. This we see so pronounced in his "Glorification de la Loi," for the ceiling of the Cour de Cassation of the Palais de Justice. Law is seated upon a throne, surrounded by her attributes, Equity, Prudence, Vigilance, Jurisprudence and Authority, under the form of beautiful women, who receive the oaths of a judge clad in scarlet robes. Exhibited as it was in a perpendicular position at the Salon (1881), it was difficult to judge of the effect of color; and probably in its proper position and light, the tones may appear less crude. But the fault of the composition is the modern style and extreme fashionableness of the models chosen, which remind one of Makart and Etty, who allowed his water-nymphs and goddesses to wear their hair in flat bands upon their cheeks, after the manner of ladies about 1830–40. In like manner these attributes' heads are the heads of women of the present day. This is a mistake: allegorical figures should not have the appearance of unclothed models; and in this respect some of Baudry's smaller works are more pleasing than the "Glorification," and the Opéra pictures. At an exhibition of the painter's work at the Orangérie in 1882 (?), there were several that were charming: "Les Noces de Psyché," painted for Mr. Vanderbilt, was a delicious specimen of color; so, too, a smaller ceiling, "Les Attributs de Diane, chasseresse."

Baudry's first picture (now in the Luxembourg Museum) is the key-note to all his later work — the influence of the old masters adapted to his own wants. All his life we see this in both subject-pictures and portraits. "Fortune et le Jeune Enfant" is an echo of Titian's "Sacred and Profane Love" in idea and in color, partaking of all the golden hues and rich carnations of the great master. It seems as if he conceived each picture in the spirit of some of his forerunners; not that he is, by any means, guilty of plagiarism; but he appears always to have had the work of some great master in his mind, which gave the key-note to the composition. The portraits show the same tendency. Sometimes it is a Holbein, sometimes a Clouet, sometimes, as in the portrait of Charles Garnier (the architect of the Opéra), the Florentine school which is uppermost in his thoughts. His friend, Edmund About, clad in a drab-cloth coat trimmed with fur, against a blue-black ground, had all the feeling of a Clouet. Precise as a miniature, this little portrait is a study, or a "symphony" in blue and drab. His earlier portraits are finer than the later ones, which err, (the ladies) on

the side of flimsiness; but the little Duc de Montebello (1882), with his dark-red costume and white collar, is a vigorous and fine study of color. At other times he had the Venetian cloak upon him, as in the rigid, thoughtful, and expressive portrait of Guizot.

Amongst the finer mythological works are the cities of Europe, painted for the duchesse de Galliera: Rome, Naples, Florence, Genoa, Venice, with their respective attributes. These, and many other works, were exhibited in the Orangérie in 1882; and in 1883 a number of his portraits were to be seen at the Beaux-Arts Exhibition of Portraits d'un Siècle. St. Hubert is a curious imitation of an early picture, with all its confusion of thicket, stag, and huntsmen painted for the château of Chantilly. The Duc de Chartres sat for the saint, and the young Duc d'Orléans for the page. In 1882, at the International Exhibition in the Rue de Sèze, amongst others, was Baudry's "Perle et la Vague," one of, if not the, finest of his easel pictures. A woman of pearl-like tints, and exquisite form, just budding into womanhood, is on the edge of the bluest of seas, washing a shell-strewn sand. It is marred somewhat by that strange semi-satirical smile — almost a smirk — which Baudry seems to have loved in womankind, and which we see for the first time in the "Fortune." But his greatest work, far outshining his Opéra *foyer*, is the "Enlèvement de Psyché par Zéphyre," a delightful young boy with butterfly wings. Here the painter is at his best — poetic, supple, refined, the whole composition bathed in a sublime harmony of color. This is his last great picture — the outcome of all his studies, and it will probably outlive the Opéra decorations, which, having been commenced during the Empire, is in the unrefined, voluptuous taste of that period.

Baudry's work was multifarious. Besides decorative ceilings, portraits and pictures, he furnished designs for the Gobelins, designs for the 1878 Exhibition-diploma, for the 100-francs banknote in 1879; and he was to have a share in the decoration of the Panthéon. He longed to give to the world a History of Jeanne D'arc, treated with fifteenth-century local coloring; but the end came too soon; and we all the more lament it, as anything worthy that noble page of French History has yet to be painted. Many are those who have essayed it in painting, sculpture, poetry, and music; but alas! with equal ill-success. Would Baudry have succeeded any better than the rest? We cannot tell; but at least the Angel of Death has spared us the pain of seeing one of the greatest of nineteenth-century painters added to the list of hopeless failures in trying to represent the picturesque and saintly life of the greatest of France's daughters.

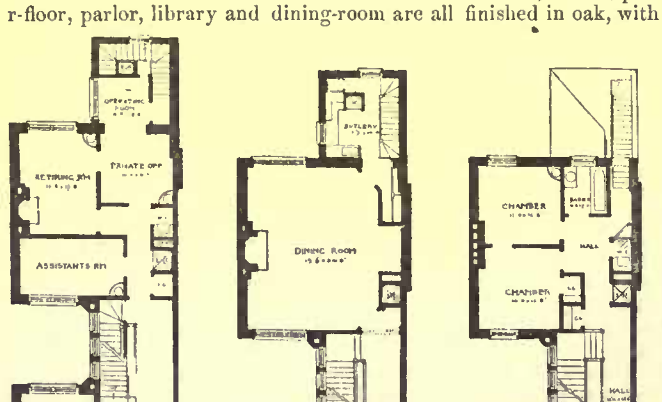
S. BEALE.



[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF DR. THOMAS, FIFTH AVENUE, NEW YORK, N. Y. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

THIS house is built of pressed brick, with Belleville stone details, the bay-window of parlor being of repoussé copper, and the roof tiled with Akron tiles. The basement-floor, offices, par-r-floor, parlor, library and dining-room are all finished in oak, with



heavy-beamed ceilings. The house is lighted through the middle by a court. A feature of the house is a small hospital on the roof, carrying out a hobby of the doctor's for quarantining any member of his own family stricken with any infectious disease.

MARKET-PLACE AND CHURCH OF SAN DIEGO. AGUAS CALIENTES, MEXICO.

[Gelatine Print, issued only with the Imperial and Gelatine Editions.]

THE CHURCH OF SAN DIEGO. AGUAS CALIENTES, MEXICO.

FOR description of this and the foregoing gelatine-plate, see the article, "Strolls about Mexico," elsewhere in this issue.

SKETCH FOR AN INTERIOR. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

ATLANTIC COAST LINE UNION STATION AND FREIGHT-HOUSE, RICHMOND, VA. MR. W. B. POWELL, ARCHITECT, PHILADELPHIA, PA.

MURAL PAINTING.[1] — VII.

BYZANTIUM AND MT. ATHOS.



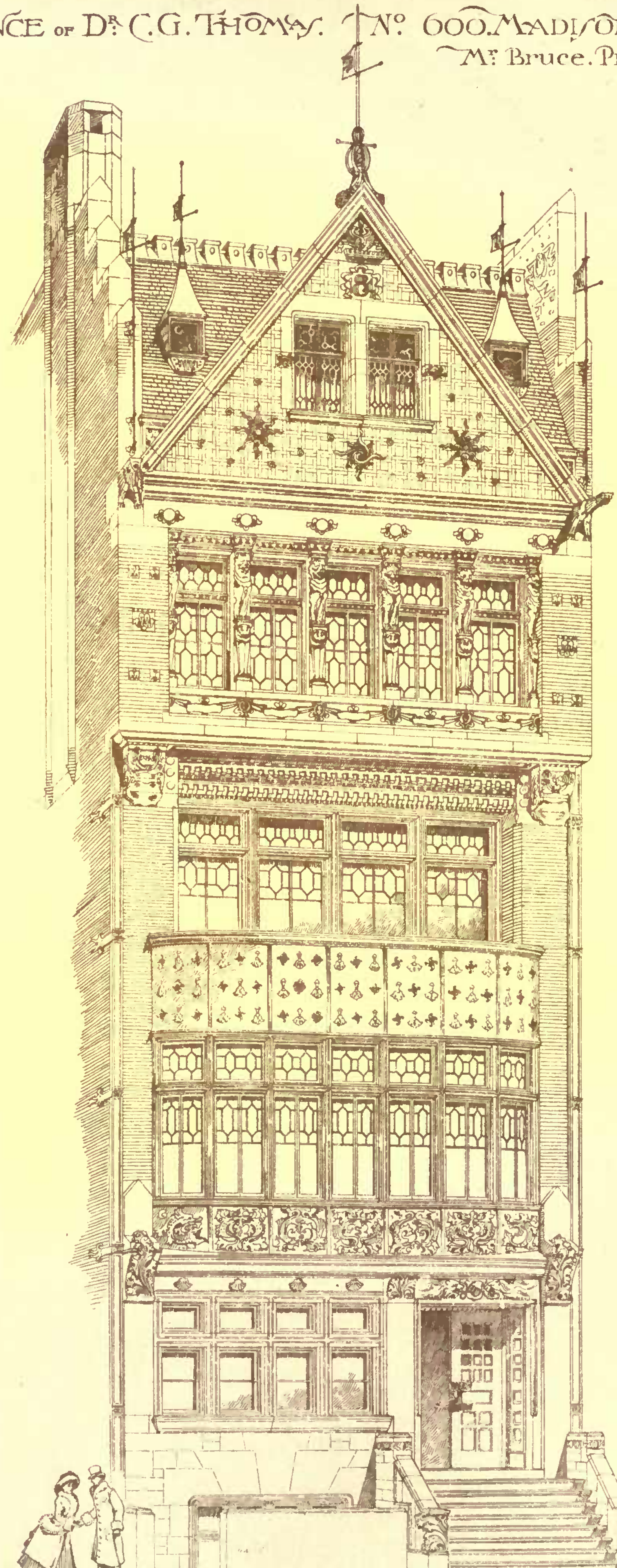
WHEN Christianity crawled out of the catacombs she was indigent and ill-clad. Raised suddenly from the dust — rather from the bowels of the earth — by the imperial fiat she must needs be clad with official splendor. Rich basilicas supplant the gloomy crypts, and lustrous, majestic mosaics the rude and simple paintings of the catacombs. Previously mosaics had been used with profusion chiefly for pavements, but now they glisten on either wall of the temple, that they who know not their letters may thus learn "the noble actions of those who have served God faithfully." Byzantium is the capital of the Empire. If she is not always beautiful she is at least resplendent. An Eastern love of sumptuousness is ousting the sculpturesque feeling for form. Mosaicists are exempted from taxation to give a fillip to their art. When mosaics are too costly, paintings are substituted.

So it came to pass that painting posed in the garb of mosaic, and not the reverse, as in the days of Titian, and later still, in those of Cavalier Arpino. There is something awfully grand in those simple creatures of solemn, impassive aspect, and colossal size, towering o'er mortals below — actually and ethically. This was a great age for mural decoration, which, with varying excellence, has lived uninterruptedly to the present day. The compositions were more symmetrical then than in the days of the Italian Renaissance, more stately, and, if I may be allowed the term, more processional. They were deficient in varied action, and dramatic force and life; but they gained thereby in grandeur and dignity. These were evil days for monumental sculpture. For a long time the traditions of the art survived, and the old influence was felt, but it was never in odor of sanctity with the church. The goldsmith was the sculptor's legitimate successor. The iconoclasts of the eighth and ninth centuries gave the *coup de grace* to sculpture. Religious figure-painting was not exempted, but it was treated more leniently. It took refuge in the monasteries where zealous monks could paint and illuminate without fear of detection, or in spite of it. But the iconoclasts though fanatics, were not barbarians. On the contrary, they encouraged the arts in their civic character. Magnificent buildings were constructed and adorned with splendid mosaic figure-compositions. Painting gained rather than lost, for it became less hieratic. Byzantium was at the zenith of her power under the Macedonian dynasty (867 1057), and the arts flourished with the exception of sculpture, which was never rehabilitated by the triumphant antagonists of iconoclasm. Bas-reliefs were tolerated as less real than statues and more akin to painting. Byzantine stuffs, ivories, bronzes and *objets d'art* were pre-eminent. Then came the ghastly sack of the town by the Crusaders (1204), in comparison to which the pillage by the Turks (1453) was as sounding brass. The wholesale looting and burning of all that was choicest and best in both literature and art by those vandal enthusiasts, left but little of value for the much abused victorious Moslems. Priceless treasures perished in the sickening devastation. Contemporary descriptions of the city on the eve of its calamities read like tales of fairyland. Even when its glory had departed, some two hundred years later, it contained not less than 3,000 churches. In 1261 the Greeks again wrested the remnants of the city from the Latins, and there appeared the adumbration of a Renaissance. But the palmy days of the Eastern Empire were past, and mural decoration, notwithstanding certain restorative efforts that bore some fruit, was on the decline when Mahomet II obliterated it with whitewash. Mosaics were then giving place to less costly paintings. Just what this painting was in its best days we do not know. We must judge it inferentially from the mosaics and miniatures that war and fanaticism have spared. At this time the types were already fixed and it was relegated to the monasteries.

[1] Continued from page 107, No. 531.

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Residence of Dr. C. G. Thomas. No. 600. Madison. Ave: N. Y. C:
Mr. Bruce. Price. Architect.



Drawing. finished by. E. Eldon Deane.

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Church of San Diego, C

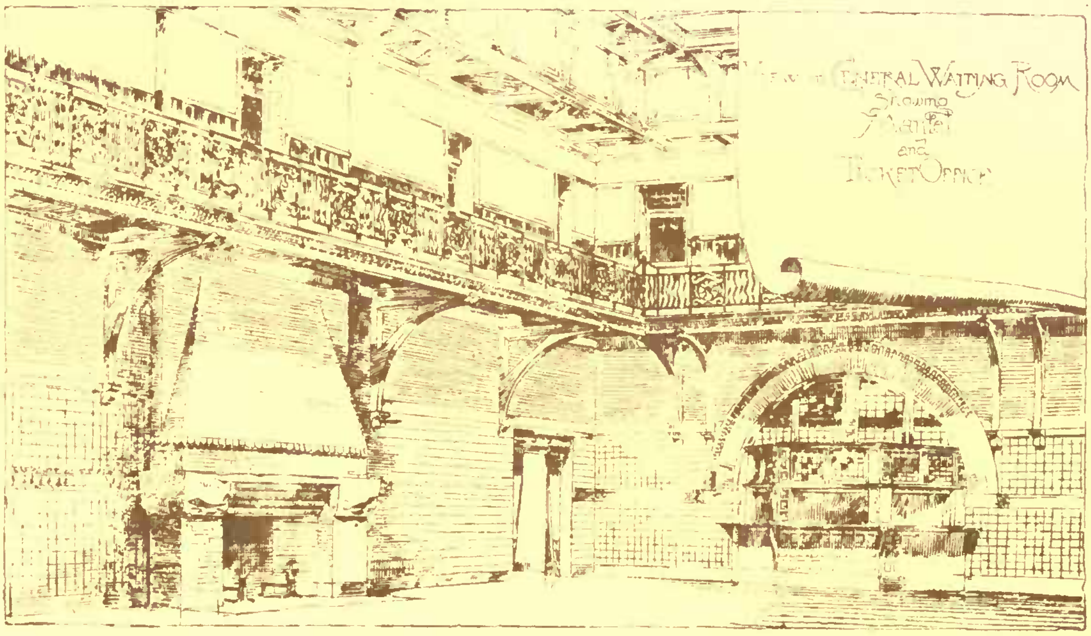
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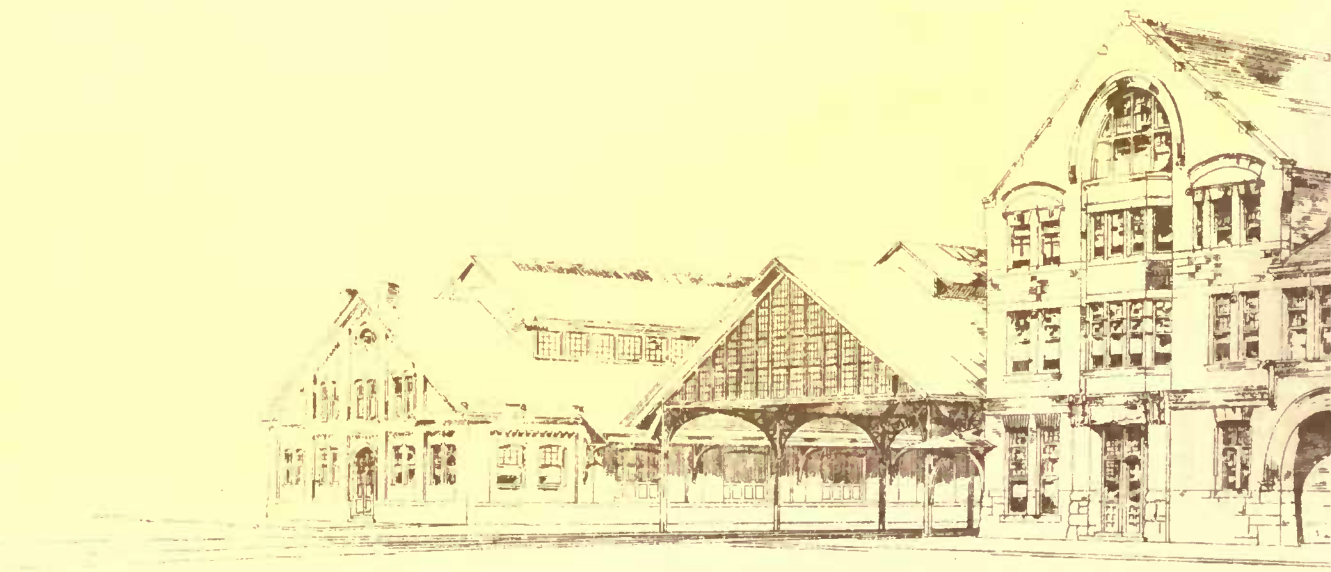


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...as Calientes, Mexico

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ATLANTIC COAST LINE

UNION STATION and FREIGHT WAREHOUSE

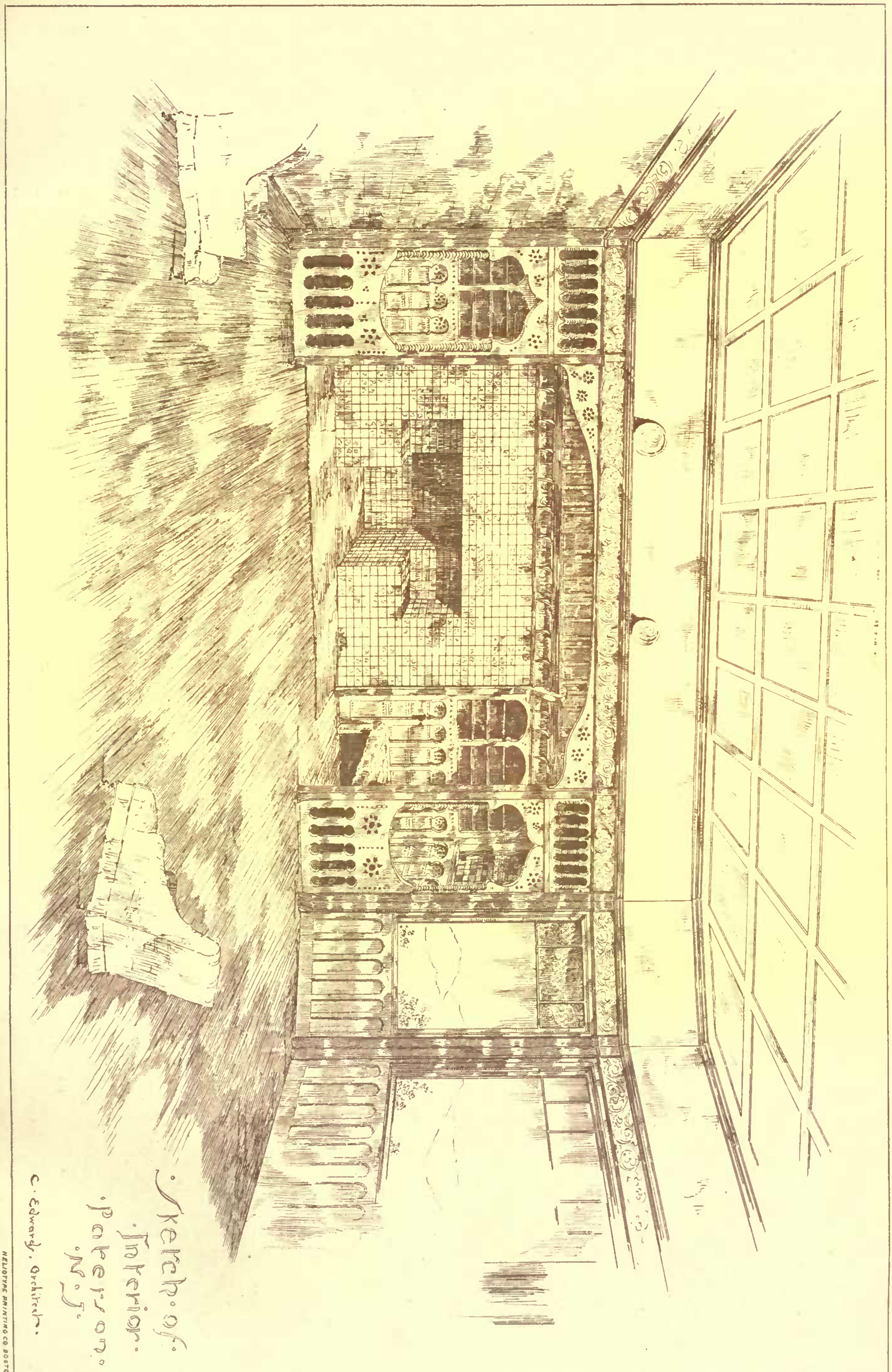
RICHMOND VA.

W. BLEDDYN POWELL. ARCHITECT.

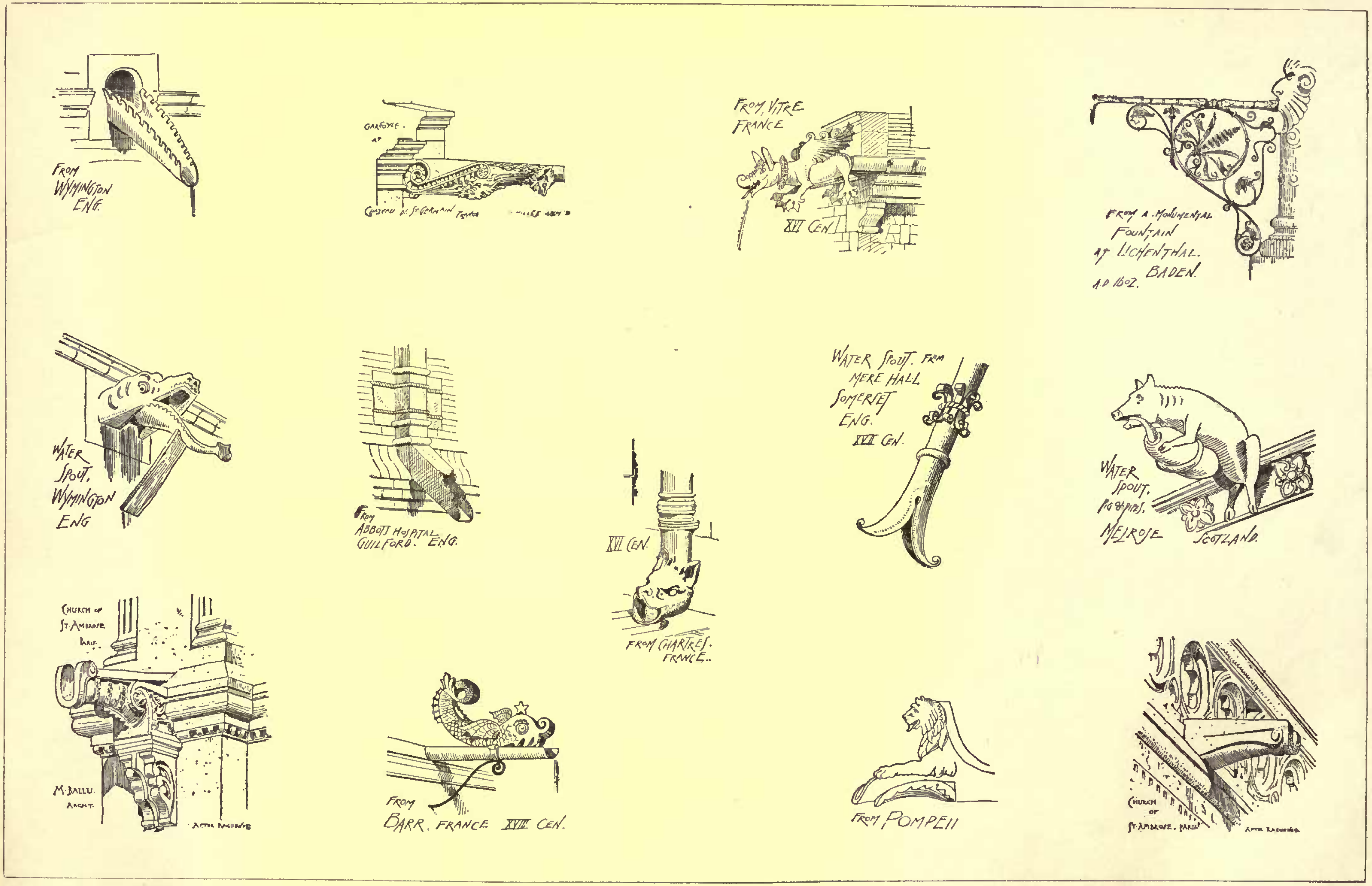


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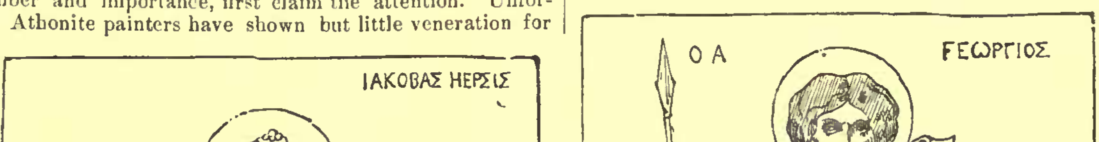


GARGOYLES AND RAIN-SPOUTS.

Of all the monasteries those of Mt. Athos were, and still are, deservedly the most celebrated. The Holy Mountain, as it is called by the Orthodox Greeks, rises from the southern extremity of the most easterly of the three Macedonian peninsulas. Its monasteries have long maintained a semi-independence, even under Turkish rule. They form a monastic republic. Their early history is at times obscure; but however miraculous may have been their origin, they attained no importance till the tenth and eleventh centuries. The republic was organized by zealots of high birth. Slaves, Bulgarians, Armenians, in fact all nationalities of the Greek faith, hastened to found convents on the Mount. The emperors multiplied the privileges of the Athonites, and freed them from the patriarch's authority. During the short-lived Latin Supremacy (1204–1261), they were sorely vexed; but they were amply indemnified on the return of the Greeks to Byzantium. Even Mahomet II granted them the maintenance of their privileges. "Thus by a remarkable combination of circumstances, everything seems to have conspired to preserve this monastic state from those depredations that in so many other places have overthrown from roof to foundation the Greek churches and convents." [1]


A Monastery on Mt. Athos, after a Byzantine Engraving.

Though there are still some interesting mosaic fragments of the twelfth or thirteenth century, the paintings in these monasteries, both by their number and importance, first claim the attention. Unfortunately the Athonite painters have shown but little veneration for the works of their predecessors. They have kept their paintings in a chronic state of restoration, or have entirely repainted them. Many of the convents have their own painters who require but little time and money for their work; so that it is difficult to find frescos antedating the sixteenth century. But inasmuch as the personal inspiration allowed the painter is comparatively slight, and seeing that the types, color, and composition were fixed by almost immutable laws at a very early date, it is fair to assume that the paintings of to-day, though doubtless inferior in execution, very strongly resemble those of the best epoch.



Mural Paintings from Mt. Athos, now in the Louvre.

An interesting and important discovery was made by Didron on Mt. Athos in 1839, bearing directly on the Byzantine technique and iconography. As this paper is nothing but a compilation — though not devoid of interest, I trust, owing to popular unfamiliarity with Byzantine mural painting — I shall freely utilize Didron's investigations, sometimes translating them literally, sometimes paraphrasing them.[2] After visiting many churches in Greece, he was greatly impressed by the large number of figures, colossal and diminutive, that swarmed on every available wall-space — narthex, nave, apsis, dome, archivolts — everywhere, in fact; and also by the concordance of the same figures in different churches. In that of Salamis (not large, I should infer, though he makes no direct statement as to its size) he counted over 3,000 figures, all executed by one master-painter, aided by his three pupils, according to an inscription borne by an angel:

"1735. *This holy and venerable temple has been painted by the hand of Georgios Marcos, from the town of Argos, with the assistance of his pupils, Nicolaos Benigelos, Georgakis, and Antonis.*"

"If in France to-day," writes Didron, "where our painters are well enough informed, a single artist should be commissioned to represent in some monumental edifice — in the Cathedral of Paris, I will suppose — the universal history of a religion as illustrated by its heroes, and the events of that history, it is doubtful if he could execute so vast a composition without long and profound research. I will go further and say that we have not a single painter capable of bringing such a work to a successful termination. There is not one of them learned or strong enough to carry such a burden. But at Salamis the painter has not only represented scenes and characters, but he has particularized them by means of explanatory inscriptions and quotations, and these quotations are drawn from the Bible, and from a vast number of religious works. . . . The difficulty is thereby greatly increased, and surely no French artist could be found with the knowledge that such an enterprise exacts. What a man this painter of Salamis must have been to accomplish such a task. Neither my companions nor myself could cease to marvel. I questioned the monks of the convent, especially the most learned, but could get nothing out of them. . . . Yet I was at Salamis, in the very church where he must have passed his life, and I was addressing monks whose immediate predecessors must have been contemporaries of the painter."

Didron had not yet seen Mt. Athos, the great formative school of Byzantine painters, the Italy of the Eastern church. There were in it in his days nine hundred and thirty-five churches, chapels and oratories, almost entirely covered with frescos, and filled with pictures on wood; not to mention the paintings on the refectory walls and elsewhere. Arriving at the Mount, it so happened that the first church he entered was new, and from which the staging had not yet been removed. A painter from Karès (the capital of Athos), assisted by his brother, by two pupils, and two young apprentices, were frescoing the whole of the interior porch that precedes the nave. The first of the pupils — the eldest and a deacon — was destined to take charge of the atelier at the master's death. I rejoiced greatly at the happy chance that would probably reveal to me the secrets of these paintings and painters, and which would doubtless answer the questions that I had vainly asked at Salamis and Athens. I mounted the staging and saw the master painter, surrounded by his pupils, decorating the narthex of the church with frescos. The young brother spread the mortar on the wall; the master sketched the picture; the first pupil filled in the outlines drawn by his chief, on those parts of the picture which the latter had not time to finish; a young pupil gilded the *nimbi*, painted the inscriptions and ornaments, while two others, younger still, ground and diluted the colors. In the mean time the master-painter "drew in" his picture, either from memory or from inspiration. In an hour, under our very eyes, he traced on the wall a picture representing Jesus Christ charging his apostles to evangelize and baptize the world. The Christ, and the eleven other personages, were about the size of life. He drew them from memory without cartoon, sketch, or model. On examining the other pictures that he had finished, I asked him if he had executed them in the same way; he answered in the affirmative, and added that he very rarely effaced a line."

[1] "*L'art Byzantin*" par Ch. Bayet. A. Quantin, Paris.
[2] "*Manuel d'Iconographie Chrétienne.*" A. M. Didron, Paris, 1845.

"We were dumb-founded, for these paintings were incontestably superior to those of our second-rate artists who paint religious pictures. By some persons — and I am of the number — the painter of Mt. Athos would be classified with the best living artists, especially if executing religious paintings."

Of course, due allowance must be made for Didron's very natural enthusiasm which has its licenses as well as poetry, so that we can graciously pardon any exaggeration. M. Bayet, in his recent handbook of Byzantine art says of these Athonite paintings, that "One must not expect as a rule to find in them either careful drawing or a scholarly study of color, but merely the traditions of a great decorative school." He bears testimony, however, to their impressiveness.

Having passed a month in making the tour of the Mount, Didron again returned to his decorator, whose work in the mean time had advanced apace. He had many questions to propound concerning certain artists, living and dead, whose names he had read on their signed works. With but one exception, Father Joasaph — for such was the painter's name — had never heard of them, and that exception was the celebrated Panselinos, the patriarch of the school. During their conversation Joasaph worked continuously, "and I," says Didron, "continued ecstatic before his prodigious facility and astonishing memory." "But, sir," he said to me at length, "all this is very much less extraordinary than you suppose, and I marvel at your surprise that increases rather than diminishes. Look, here is a manuscript that teaches everything we have to do. In this place it tells us how to prepare our plaster, our brushes, our colors, how to compose and where to place our pictures; in that place are written the words and inscriptions we have to paint, and which you have just now heard me dictate to these young people, my pupils."

"I seized," continues Didron, "with eagerness, with avidity, the manuscript that Joasaph showed me, and I read in the table of contents that the work was divided into four parts. The first part, entirely technical, was devoted to an exposition of the methods of painting employed by the Greeks, their manner of preparing brushes and colors, of laying the grounds for frescos and pictures, and of painting on these grounds. In the second part were described in detail, and with remarkable precision, those symbolical, and especially historical subjects that painting may represent. The third part determined the place in a church, porch, refectory, or fountain, where such and such a subject, or figure, should be placed, in preference to any other. Finally, in an appendix, the characters of Christ and the Virgin are fixed, and some of the inscriptions given that abound in Byzantine paintings. This manuscript was entitled: Ερμηνεία τῆς ζωγραφικῆς, "*Manual of Painting.*"





Mural Paintings from Mt. Athos, now in the Louvre.

"Then the immutability and identity of the types figured in every part of Greece, and from Syra to . . . Constantinople, were explained. The form of the hair and beard, the age, physiognomy, costume and attitude are recorded in this book. Thus, with a fair memory and average intelligence, assisted, on the one hand, by this *codex*, and on the other by the continual view or study of the old paintings, and especially by the constant practice of art, almost any painter could easily be a Joasaph. Seeing him execute such works, I had, in fact, a certain admiration for the man, who had nothing to recommend him in expression, word, or bearing, and who was commonplace, rather than distinguished. So the fine series of paintings at Salamis was accounted for, and the complete oblivion of Georgios Marcos. What was then happening at Mt. Athos must have happened in France and all Christian Europe in the Middle Ages. The composition and distribution of the sculptures that decorate the portals of Amiens, Reims, and especially Chartres cathedrals, would bear witness to a great genius, if any Picard, Champenois, or Besançon artist had invented them; but they only call for an ordinary man, aided by a manuscript similar to that of Mt. Athos. It is just the same for glass-painting."

The particular copy of the *codex* that Didron saw was not more than 300 years old, and had been freely annotated both by Joasaph and his master — annotations that would be incorporated with the text when re-copied. Thus the later *codices* are somewhat more voluminous than their prototype. The "*Manual of Painting*" was composed by a painter who signed himself Denys, monk of Fourna d'Agrapha. He "flourished" probably about the middle of the fifteenth century, and was, therefore, a contemporary of the oft-quoted Cennino Cennini. Strange that these two painters, of no great artistic fame, mutually alien in school as well as country, yet so like in their innocent faith and veneration, should each have composed a manual of his art, and that both should have been published for the first time in the present century, and within less than thirty years of each other (Cennino's in 1821; Denys's in 1845). Denys belonged to the famous school of Saloniki, whose recognized chief was Panselinos, the Giotto — or, as some style him, the Raphael — of the Byzantine school. Though not the immediate master of Denys, the latter stood in the same attitude of veneration towards him, as the protagonist of his school, that Cennini did towards Giotto, though both were dead. Cennini writes: "This plan was adopted by Giotto, the great master, who had Taddeo Gaddi, his grandson, for his disciple for twenty-four years; his disciple was Agnolo, his son; I was Agnolo's disciple for twelve years, and he showed me this method," etc. Denys writes: . . . "The little art that I know I have studied and acquired with difficulty since childhood, striving to imitate, as well as I could, the celebrated and illustrious master Panselinos of Thessalonica. After having worked in the admirable churches on the Holy Mount of Athos, which he adorned with magnificent paintings, this painter, by the mastery in his art, shone with such dazzl ng brilliance that he was compared to the moon in all her splendor." (Πᾶσα Σελήνη = Πανσέληνος = full-moon). It is fair to assume that Panselinos was a contemporary of Giotto — an assumption that is supported by historical evidence and the style of his work. Though the acknowledged head of the Byzantine school, it must be remembered that he found the types already fixed, some dating back to the fourth century. Doubtless he played with these types, as all men of genius must ever play with restrictive conventionalities, though probably much less than the leaders of the Latin schools, who were allowed far greater latitude in their interpretation of sacred themes. The Greek artists never emancipated themselves from the decrees of Nice,[1] though, doubtless, every now and then able men, like Panselinos, took certain venial liberties. The fact that all the Athonite painters were monks, and some of them both monks and priests, must still further have tended to cramp their inspirations, and to keep them within prescribed conventional bounds, grateful to asceties, but baneful to art. As I remarked, in a previous paper, an excess of superstitious zeal would hamper a creative artist; and for this reason it is better for art, that the functions of painter and monk should be divorced, even though the latter be merely nominal. The Manual does not state whether Panselinos was a monk; it merely refers to him as "the celebrated and illustrious master." But few of his works are still extant. Those at Saloniki — the seat of the school — are but mere fragments, peering here and there

[1] "*Non est imaginum structura pictorum inventio, sed Ecclesiæ Catholicæ probata legislatio et traditio. . . . Atqui consilium et traditio ista non est pictoris (ejus enim sola ars est). verum ordinatio et dispositio patrum nostrorum, quæ ædificaverunt.* (*Synodus Nicæna II.*") 787 A. D.

through their pall of Turkish whitewash. The monks of Mt. Athos are very ready to show the visitor a goodly number of his paintings; but their statements are contradictory and fabulous. Some of these paintings, however, appear to be very old and of a good style; among others — those of the Protâton at Karyès. M. Bayet says that, "a Nativity of Christ and a Presentation of the Virgin in the Temple are very remarkable and much superior to the ordinary paintings of Athos: they are natural, and of an exceedingly pure taste. The forms of the women are slender and elegant, their movements full of life; their proportions are correct, and a refined beauty illumines their regular features; other compositions show the same qualities. Unfortunately, all these paintings are threatened with impending ruin; the lines are becoming effaced, the colors are growing pale, the plaster is cracking and falling. One cannot but feel sad in seeing the almost unknown *chefs d'œuvre* of an art, in itself so little known, thus miserably disappear."[1]

To see such a manuscript as the Manual of Denys, is to desire to possess it. Didron made Joasaph an offer for his copy, but the latter naïvely replied that he could do absolutely nothing without it; in losing his Manual he would lose his art — his very hands and eyes. "Besides," he added, "you can find other copies of this manuscript at Karès; every atelier has a transcript of it, and, notwithstanding the decadence into which painting has fallen on our holy mountain, there are still at Karès four complete ateliers." And so Didron hastily betook himself to Karès, and straightway went to the atelier of one Father Agapios, an aged man, who painted chiefly for his amusement. Inasmuch as he received no more orders, and needed some ready money, he was on the point of selling his copy, but on reflection changed his mind, thinking that death might not be so very near, and hoping that he might receive other commissions; in which case he feared that his *confrères* would not allow a copy to be made from their manuscripts to replace a sold copy. He might, perhaps, wish to leave his Manual at his death to one of his assistants. "In vain I pressed him; he refused. To soften this refusal . . . he sold to M. Durand, for a very small sum, a beautiful little original drawing, in red crayon, of the Virgin with the child Jesus in her arms." Finally one of the painter-fathers offered to have a copy made from his manuscript for the zealous Didron. This after a time was made, and after still farther time arrived in Paris, where it was translated by Paul Durand, Didron's fellow-traveller and most industrious draughtsman. To him we are indebted for many of the drawings made from Byzantine frescos with which we are familiar. The Manual, as I have before observed, was published in 1845. Its technical part seemed, at first, to be the most valuable. It proved to be the least so. "The recipes given were either imperfectly understood, or not understood at all; the substances mentioned apparently had no analogies with us, either on account of some real difference, or because no synonym could be found. One could neither be sure of the measures, nor of the proportions, nor of the terminology. I begged M. Mialle, Professor of Pharmacy to the Faculty of Medicine of Paris, kindly to study this part of the manuscript. . . . M. Mialle was soon obliged to give up the work, and he wrote to me as follows: 'I send you a few notes that I could conscientiously make; I could have easily augmented their number, had I not feared to pervert the truth; besides, this Manual seems to me very incomplete and difficult to consult.'" Though the first, or technical part, has but little value, the three remaining parts that treat of the Byzantine iconography are of "capital importance;" throwing considerable light even on the Latin and Gothic.

Coupled with Didron's personal observations on the staging — the technical part of the Manual has great interest for those who are concerned with mural painting. It is another phase of fresco, which will be developed in the next paper.

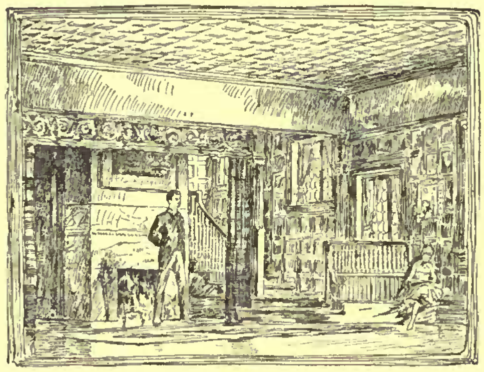
Notwithstanding the rigidity of its traditions, several attempts have been made to Italianize Byzantine art. Bayet cites as an example the works of one artist named Nicephorus, who executed, in 1795, at Ivirôn, scenes from the Apocalypse. Without doubt, he had visited Venice. "The Byzantine painters of Athos used harsh tones for the face and flesh, at least, they made no effort to blend them. . . . It is by means of vigorous and dark lines that they indicate the contours, and their drawing is sharp and hard." Nicephorus, on the contrary, used delicate lines and graded his tones, introducing freely the Italian chiaro-oscuro; another painting, dated 1814, was inspired by Reubens's "Descent from the Cross." "For the last few years, however, the Russians, established in the great monasteries of Rossicon and Saint Anna, have been affecting a clumsy imitation of Western works. Even in the Greek convents I have found in the painters' hands specimens of German engravings, from which they copy the compositions. These plagiarisms will kill Byzantine art. The artists who remain faithful to the ancient traditions lament this decadence; but, notwithstanding their good intents, they have no longer vigor enough to resurrect an art, long since on the wane. Some of them are still very skilful, but their personality is gone." Father Macarios, the strongest painter on the Mount, after Joasaph, regretfully said to Didron that "formerly the brushes were better, the quality of the colors excellent, hands were deft and hearts ardent; men painted slowly and thoughtfully, that they might produce beautiful works and gain paradise."

FREDERIC CROWNINSHIELD.

[To be continued.]

[1] Figures 1, 2, 3, 4. These figures are traced from chromo-lithographs in "*Les Arts Sumptuaires*," Hangard-Mangé: Paris, 1858. Ch. Louandre, in the accompanying text, states that they were drawn by D. Papety, in the convent of Agiuá Labra, on Mt. Athos, and at the time of his writing were in the Louvre. The originals formed part of a vast fresco attributed by tradition to a monk named Pantelinos. [He surely means Pans-linos.] They represent Saints Leontius, James-the-Persian, George, and Mercury. Whether by Panselinos or not, they evidently belong to the best period of Byzantine art, if one may judge from these copies. They are heroic, solemn, impressive creations, quietly harmonious in both line and color. Vitet says that they "are of the grandest character, proudly and simply posed, truly Christian, yet conserving withal a certain family likeness to the gods of the Parthenon.

FOUNDATION WALLS.



IT is strange that, with all our boasted progress in engineering and practical architecture, we are really little better off than the Romans were in the construction of basement walls that shall resist moisture. In looking over the resources of the builder in such matters, we discover very little that is really new, although modern authors would sometimes have us believe we are greatly in advance of all that pertains to constructive expedients. To take, as an example, the modes by which walls in a damp position and forming a basement may be built: The hollow, or cavity wall, is not new. Vitruvius, writing 25 B. C., says: "If a wall is liable to continual moisture, another thin wall should be carried up inside it, as far within as the case will admit, and between the two walls a cavity is to be left lower than the level of the floor of the apartment, with openings for the air at the upper part; also openings must be left at the bottom, for if the damp does not evaporate through these holes above and below, it will extend to the new work. The work is then to be plastered with the 'potsherd' mortar, made smooth and then polished with the last coat." We have here a most perfect description of the best principles upon which hollow walls can be built, and the explanation given of the use of the openings for evaporation, describes, in the most scientific manner, the reason of the failure of many modern hollow walls. How few builders of such walls take care to make the cavity extend below the level of the floor, or see that openings are left. When there is no space for another wall, Vitruvius recommends a construction of hollow tiles, placed against the outer side of the wall, with channels leading to the open air. He says: "Then tiles of the size of two feet are placed on one side of the channel, and on the other side piers are built of eight-inch bricks, on which the angles of two tiles may lie, that they may not be distant more than one palm from each other. Over them other tiles with returning-edges are fixed upright from the bottom to the top of the wall, the inner surface being carefully pitched over that they may resist the moisture; they are to have air-holes at the bottom and top above the vaults," etc. Such is the description which is illustrated in Perrault's French edition of Vitruvius's treatise. The tiles spoken of may be more clearly understood if we call them trough-like in section (⌴), these being laid endwise, so as to form a series of square openings up the wall to be protected, the bottom-course resting on brick piers, having below a gutter or drain between them and the wall. These vertical terra-cotta or stoneware tiles are placed with their unclosed side against the wall, the inner edges of which are pitched. Though there have been several similar modern tiles made upon this plan, we do not think they are so simple, and they are certainly seldom employed. The Romans constructed their camps with due regard to dryness. When the wall was exposed to the ground on one side, the hollow wall was introduced. The concealed area is no new invention. The camp of Adrian at Tivoli showed a double wall. We read of walls being constructed in three sections, the outer and inner walls built of regular courses, and the centre-cavity filled up with small stones without mortar, which served the object of a drain. The inner and outer walls were cramped with iron.

The concealed area is still a good plan for protecting the outside walls from dampness, but is very seldom adopted. The area may form a drain, intercepting the moisture from the soil and carrying it away, or it may be simply a passage covered in below the ground-level outside the building. The area may be covered at the top by a semi-arch, cemented or asphalted at the top to form a water-shed just below the surface, perforated tiles or bricks being introduced for ventilation. The area-bottom should form a drain, to intercept and carry away the moisture. Another form of concealed drain is that of an egg-shaped sewer, with openings left in the outer wall of area for the moisture from the earth. The invert and inner wall can be built of concrete, and the sloped water-shed over the arch can be also of this material. Viollet-le-Duc describes a similar method of protection, composed of a slanting top of concrete to throw off the surface-water from the building, and

slits in the side-wall of area for intercepting the water, and a hollow invert or bottom of concrete for conveying it away. But there are simpler methods. A cheap method of treating outer walls exposed to dampness is, to excavate a trench twice as wide as that required, the space between the outer face of wall and the excavation to be filled with broken stone or bricks. The "filling" then forms the office of an intercepting drain. Such a treatment is not sufficient for porous stone or brick walls, and some other precaution becomes desirable. In addition to the rubble-drain, the outside of the wall may be protected by a thin wall of bricks bedded and faced in asphalt, or the hygeian composition, commencing from the damp-proof-course, and extending upwards above the surface of the ground. The cellar-floor should also be paved with asphalt. The drain or bottom of external excavation, filled with rubble, is better made below the footing of the wall, so that the water should not unnecessarily be brought into contact with the wall; a tile-drain, of small diameter, laid below the footings, may be of service. Sometimes the interior wall is built of brick to form a hollow, allowing an air-space of about two inches to four inches. A good plan is to make the outer face of the wall above the ground overhang the wall below, by which means the water trickling down is arrested and cut off by the outer filling. Projecting slope-tiles of stoneware may be introduced into the joints above the ground-level for the same purpose. Such a tile-course forms a useful water-shed to throw the water off from the wall, and, where hollow tiles are used as a wall-casing such as we have described, its use is of great moment in covering the upper openings.

By the combined means of asphalt for damp-proof courses and facings, and dry areas or hollow walls, there is no difficulty in making an underground-cellar perfectly impervious to moisture. The chief points are in taking care to have the hollows or areas sufficiently below the level of the floor to make the coating of asphalt continuous from the cellar-floor through the wall, and to the surface of ground outside. The ties used for hollow walls are various. Iron-ties of cast and wrought-iron, if galvanized or coated with pitch or asphalt, serve the purpose admirably, though several kinds of brick-ties are manufactured, which give a good tie without breaking the bond, and prevent the passing of moisture along the upper surface of the brick. Wedge-shaped ties are also made. There is a variety of cheap wall-linings made of enamelled or glazed bricks, terra-cotta slabs, glazed stoneware, and compounds of different kinds. Tile-facings and damp-proof courses afford a very inexpensive means of arresting the moisture and providing a good substitute for a dry area or hollow wall. Simple, and, in some cases, efficient, protection is rendered by water-sheds constructed along the exposed wall, and slanting downwards at a certain angle some three feet or four feet in projection; it may be of a course of brick or asphalt, the first course being grooved into the wall. But a well-sloped pavement of asphalt answers the same purpose of protecting underground walls. Wherever it can be built, however, an open area next the basement-wall is the healthiest mode of making a dry lower story. Open to the light and air, they are purifying, as well as protective, but in every case should be provided with a drain to carry off the surface-water.—*Brick and Tile Gazette.*

COMMUNICATIONS

THE TORONTO COURT-HOUSE COMPETITION.

Brookline, March 9, 1886.

To the Editors of the American Architect:—

Dear Sirs,—Will you allow me to trouble you once more with Toronto Court-House matters. It being too late to take the action I had hoped in concert with the six authors of the other selected designs, there does not seem much else to be done unless the following plan of action should recommend itself to those who joined in the first competition, and to whom the second is limited.

Will *all* abstain from the second one? Thus, in the most practical way, protesting against the action of the Council.

I have already returned the instructions and invitation, and refused to have anything further to do with the matter, unless the second competition be confined to the authors of the "seven selected" designs. If all will follow the same course the Council may awake to the fact that their action is a mistake. Yours faithfully,

A. H. James.

Toronto, Canada, March 4, 1886.

To the Editors of the American Architect:—

Dear Sirs,—In conjunction with the leading architects of the city, and in compliance with wishes expressed by such of the American competitors as I have been able to hear from, I have for the past three weeks been making every effort possible to induce the City Council to have the fifty sets of plans sent in last spring in the Court-House Competition rejudged. Contending that—inasmuch as the experts made no reasonable proper or scientific examination of the designs, and gave no report to show that they made any examination whatever—the city is liable to every competitor who complied with the conditions of the instructions issued for the guidance of the architects for the time, labor and money spent in preparing the designs, *i.e.*, one per cent on the proposed cost, or $2,000.

My efforts, as you perceive, have resulted in the following notice of motion, by Alderman Turner, "That new experts be appointed to rejudge the original designs sent in for the proposed new Court-House, and that those designs be judged under the name of their authors instead of their mottoes," and judging from the present aspect of the Council who now begin to understand the true state of the case, this resolution is very likely to carry.

I shall therefore be glad to hear from any of the competitors who wish to have a fair and just decision rendered on their original designs, as I take it for granted no architect will enter into a new competition without some further guaranty of just and fair treatment.

The absurd shuffle of selecting seven men, three Canadians and four Americans to prepare new plans, of itself shows that there must have been some sinister object at the bottom of all this. This move has been thwarted, but if new plans are sent in we might reasonably fear some similar action, especially as the plans have been seen, and any favored individuals would be able to work up from the designs of others.

As the above resolution will be discussed in the Council on Monday evening, March 15th, I would like the views of the competitors on the subject as soon as possible, and will be glad to furnish any further information in my power.

It will, I think, be of great service in getting the above resolution carried if those competing architects who approve of its purpose were to write to the Mayor urging its passage and giving their reasons therefor. I am, sir, etc. S. H. Townsend,

Architect.

Toronto, February 15, 1886.

To the Mayor and Corporation of the City of Toronto:—

Gentlemen,—Having on Monday last attended the meeting of the City Council and learned the course it is proposed to pursue in the Court-House matter, I think that, in justice to myself and those architects who are too far away to support their views or maintain their rights, I should place before you the facts of the case, as seen from our standpoint.

In December, 1884, your committee advertised for designs for a Court-House, undertaking to give certain prizes to the authors of designs most closely adhering to stated requirements, and further stipulating, in a circular issued March 4, 1885, that "no prize would be awarded to any plan, the carrying out of which would exceed $200,000."

Upon the strength of these promises, some fifty architects submitted designs, and, after some delay, experts were appointed, who, after spending less than a week in an examination that could not have been completed with efficiency in less than a month or six weeks, reported that none of the designs could be erected for $200,000, and, consequently, none were entitled to prizes, but recommended that seven designs, selected by them "irrespective of cost," should be returned with a cheque for $250 each, and their authors requested to send in new designs.

In the opinion just stated, that the time expended by the experts in the examination of the designs was wholly inadequate to arrive at a just decision as to their merits, I am fully confirmed by Mr. W. G. Storm, R. C. A., who says that, in the Parliament Building competition "he and his colleagues spent eighteen days in the examination of only nineteen designs."

Upon reading the experts' report, it occurred to me that it was very strange that, out of fifty designs, not one came within the mark as to cost and accommodation; so, after communicating with several of the competitors and obtaining their coöperation, I decided to test the matter, and, using my own design as a basis, submitted it to the leading men in the legal and architectural professions, judges, Court-House officials, etc., who pronounced it to be good in design, convenient in plan, and in every way suited to the requirements of the city.

I next placed the drawings, etc., before the leading contractors of the city, and obtained *bona fide* estimates, showing that the building may be erected for less than $200,000.

If this is so—and I can establish the position by unquestionable and unimpeachable evidence—it demonstrates that one, at least, of the designs passed over without consideration by the experts, fulfils all the conditions, and can be erected for the stipulated sum. And if this is so in one case, is it not probable that more have been treated in the same way? And if so, cannot the author of each of them collect at law, the value of his services in preparing the design? The counsel I have consulted says such is the case.

I have devoted a great deal of time and study, and gone to considerable expense, in preparing my design, and think I am, at least, entitled to ask that it be placed before skilled experts, competent to deal with the question, and able to devote the requisite time for the purpose, and from what I know of several of the competitors, I feel certain that many of the designs submitted for your consideration last spring are well worthy of consideration.

Now, what I claim is this: That I, at least—I am, of course, ignorant of the position of other competing architects—have fulfilled the conditions stated, and submitted a design well suited for the proposed building, in the opinion of competent persons—judges of the Courts, architects and others—and capable of being constructed within the sum limited, and that, therefore, if there is no other design superior to mine, I am entitled to be entrusted with the carrying out of the design, in accordance with the terms on which the competition was invited. If the corporation chooses to ignore and underlie these conditions, I am surely, then, entitled to be paid for my work in preparing the plans.

I have the honor to be, gentlemen, S. H. Townsend.

[We regret that this letter reached us after our last week's issue was printed.—Eds. American Architect.]

SHEET-METAL GAUGES.

MINNEAPOLIS, MINN., March 4, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — A Committee of the Architectural Association of Minn. are formulating a scheme for measurements of building materials which we hope will do away in our practice with many of the discrepancies and absurdities with which we have to deal.

Will you kindly inform us through your Journal whether the sheet metals most used in building and sold by numbers are made to a common guage, or are several guages used in numbering the goods on the market Yours, etc., COMMITTEE-MAN.

[We shall be glad to hear from tin-plate dealers on this point.— EDS. AMERICAN ARCHITECT.]

FLOOR-LIGHTS.

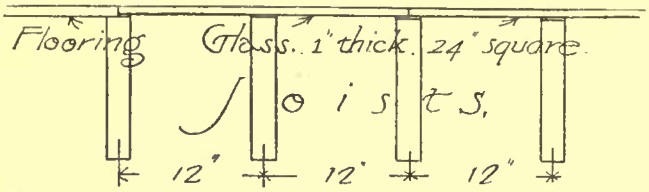
GREENVILLE, S. C., February 19, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— In a store of four floors, lighted only from front and rear (each floor), what would you consider a minimum number of square feet of skylight on roof to light the four floors (through floor lights of inch glass) sufficiently for general business purposes?

Should the number of square feet of floor-lights on each story be equal to or in excess of the number of square feet of skylight in roof?

What would you consider a safe load for floor-glass one inch thick laid as per diagram?



What would be a safe load to roll over on trucks with rubber-tired wheels? Is it definitely known whether the same formulæ that apply to transverse strains in timber will obtain for strength of glass under transverse strains? If you consider these queries of sufficient interest to deserve attention in your correspondence column, your valued opinion will be highly appreciated.

Would you advise the arrangement of glass as per diagram (bedded on felt), or would you consider an iron frame preferable.

Respectfully, E. B. RUTLEDGE.

[The necessary size of central skylight depends on the depth of store, size of front and rear windows, amount of light admitted through them, and kind of business to be carried on. We should say, very roughly, that to cover one-tenth of the roof with glass would not be too much; and we should make the area of floor light in each story below about the same as that covered by the skylight, or, perhaps, a trifle greater. Five hundred pounds distributed load to the square foot is considered safe for glass one inch thick, twelve inches between supports; and half that amount would be sufficient for centre or moving load. We should get glass twelve inches wide and lay it lengthwise of the beams. As shown in the diagram, any unequal shrinkage of the beams would leave portions of the glass unsupported. The formulæ for transverse strains in timber are applied to glass, and similar materials, but with a larger factor of safety, usually eight. There are some objections to iron frames for floor-lights, as the contraction and expansion of the metal is apt to break the glass; but we should be afraid that it might be difficult to butt the edges of the plates over felt without exposing them to chipping through the movement of the plates against each other, and the transverse joints would be neither dust nor water tight. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

A STATUE IN MILAN CATHEDRAL. — In the Cathedral of Milan a statue was lately seen to be in a bad condition, the head looking insecure. It was supposed to be a sixth-century work, and the faithful did not mind, though it looked to connoisseurs like a young Paris, granting the apple to Venus. In repairing it a hole was found at the base of the head, in which was a cameo; the peculiarity is that this cameo shows an exact view of the statue itself. The statue has been returned to its niche, and will continue to bear whatever saintly name it has had hitherto. — *Providence Journal.*

FLOOR-FILLINGS AND THEIR DANGERS. — In the *Deutsche Militärarztliche Zeitschrift* for October and November, 1885, says the *Sanitary Engineer*, Dr. Rahts has published a lengthy paper on the organic impurities and disease-germs contained in the materials used for filling the space between floors and ceilings in inhabited rooms, and on the dangers to health resulting therefrom. The materials used for such fillings vary greatly — mortar, sand, earth, etc. — and the amounts of organic matter which are liable to decomposition contained in them also vary very much, the worst filling-materials in this point of view being sand and earth. These impurities are, however, and especially in this country, of minor importance as compared with the contaminations which are added to this part of the house after it is inhabited, by dust sifting through cracks in the floors, and by leakage of water used in scrubbing the floors. Various forms of fungi and micro-organisms are found in the filling between the floors of old-inhabited houses, and this fact, taken in connection with the relation which is now supposed to exist between these organisms and certain specific diseases, is supposed by Dr. Rahts to explain the repeated occurrence of these diseases in the same house or in the same room. In other words, he supposes the space between floors and ceilings, whether full or empty, may become a dangerous source of infection, which is too often overlooked in attempts at cleaning and disinfection. This theory is supported by references to certain cases of localized outbreaks of typhoid fever and diphtheria confined to certain barrack-rooms, in which it seemed most probable that the room itself was the source of contagion. The precautions suggested are, first, that the floors shall be made water and dust-tight so far as possible, either by the construction of the floor itself, or by the use of parquet-floors, laying in asphalt, etc., or by covering the floor with some impervious material, as oil-cloth or linoleum; second, the providing of means of ventilation for the space between the floors, in order to secure the rapid and complete oxidation of all organic matters and the starving-out of disease-germs; and third, to select the filling-material with special reference to its freedom from organic matters. The subject is one of especial interest in the construction of large apartment-houses many stories in height, and the paper of Dr. Rhats should be consulted for details as to the methods used or proposed by German architects to secure the best results in floor-construction.

LOST RIVERS.— There is one remarkable case in New Mexico where the lost tributaries are plentiful but the main stream does not exist. This is in a valley which lies between the Rio Grand and Pecos Rivers. The valley begins near the Sandia Mountains, and is shut out from the streams on each side by broken mountain chains. It is a well-defined valley, not very broad, but having a length of perhaps three hundred miles. Flowing into it, especially on the western side near the upper end, and on the eastern side toward the lower, are numerous lost tributaries; but the primary stream has so completely disappeared that its bed can only be found at intervals. In this valley lie the ruins of the Gran Quivira, the existence of which is not only attested by the ruins themselves but also by the accounts of the earliest Spanish settlers. The records of the Spanish up to the latter part of the seventeenth century, when they were expelled by the Indians, are incomplete, as the Indians destroyed all that was left behind. That the Gran Quivira was well known to them, however, is shown by the fact that the most prominent ruin there is that of a church. There is now no water for many miles from the ruins. That there must have been once can well be granted, for no large city would have been built by human beings at a distance of fifteen or twenty miles from a scant water-supply. The valley may be named from this city, and would then be the Gran Quivira Valley. About half way down the valley it is broken by a long, narrow, thin layer of lava, now much broken up, and making a desolate region, locally known as the Mal-pais, or "bad land." The crater from which the lava was derived was near the northern end of the Mal-pais. Just above the Mal-pais an old river-bed is reached at the depth of about two hundred and fifty feet; below it the river-bed, when found, is at a slight depth. Southwest of the Apache Reservation the old river-bed runs into a large salt-marsh. A stream of no mean size seems to have once run down this valley. Not only has it now disappeared, but its bed is covered by lava and loose soil sometimes to great depths. As to the cause of the disappearance, it may have some connection with a tradition of the Indians, which tells of a year of fire, when this valley was so filled with flame and poisonous gasses as to be made uninhabitable. When this occurred the chronology of the Indians is not perfect enough to tell us. That it was long ago is attested by the depths to which the old bed is covered by detritus, probably washed down from the mountains, and by trees of considerable size which are found in some places in it. But that it was not so extremely long ago that it had become entirely uninhabitable is made probable by the comparatively late desertion of the Gran Quivira. It is entirely possible that the Indian year of fire may have long preceded the drying-up of the point of the valley in which Gran Quivira was situated.— *Science Monthly.*

THE PALACE AT JEYPORE. — Mr. Sala has had the good fortune to visit the Great Palace of Jeypore, and writes about it thus in the *London Telegraph:* Seven stories of such wild and lovely structure as you would expect to see only in dreams, rise here one above the other in rose-red and snowy-white balconies, oriels, arches, pilasters, lattices and domes — gay everywhere with frescos and floral ornaments. In this lowest floor, which is kept — like the second and third — as a winter-residence, we are permitted to inspect a priceless volume, the abstract of the Mahâbhârata, in Persian, made by the orders of Akbar the Great, at a cost of £40,000, and illustrated in the most exquisite manner with colored and gilded miniature-pictures, of an incredible delicacy. The Shobha Newas, floor above, is full of strange paintings on the wall, and arcades embellished with gorgeous shells of copper, silver and foil. Next we ascend to the Cnhabl Newas, or "hall of splendor," shining with polished marbles and colored enamelling. Above this is the Shish Mahal, the pavilion of glass, with endless patterns wrought in little mirrors let into carved plaster-work, and above that we step forth upon the Mokt, or "crown," of the palace, where the vast flat roof is encircled with shady alcoves and open chambers, vaulted by graceful-curved cupolas. Beneath lie the green palace-gardens, full of pomegranates, palms and bananas; and beyond, the spread of the countless busy streets and lanes, girdled by the walls, and overhung by the encircling hills, topped with forts and temples. It is vain to attempt any description of that enchanting prospect, more absorbing than any which India herself can offer. Nature and man have here allied themselves to produce the most perfect and lovely landscape conceivable. In green and gold, in rose-color and white, in distant dim blues and grays, the gardens and the city, and the far-off walls and mountain-ridges of amber group together at our feet — a picture to delight the eye and feast the mind. But how can words reproduce Govinda's temple, between the upper and lower gardens; the snow-white sides of the Badal Mahal, or "Cloud Palace," on the edge of the lake; the dark ramparts of the fortress in the mountains

and those long lines of rose-red streets which intersect Jeypore? To complete the rich colors of the scene, a feast is being given to Brahman men and women on one of the many flat roofs of the Upper palace, and attendants go about bearing the Maharajah's bounty in the form of cakes and sweetmeats, amid some three or four hundred men and women clad in holiday-dresses of crimson and purple, saffron and blue, glittering like flowers in the sun, which shines upon the "City of Victory," as if its people were indeed his children. Whoever has viewed that prospect from the palace-roof of Jeypore, has seen India in her inmost grace and beauty.

The Professing Architect, as Seen by some Others. — Men who live in houses do not build them; they hire them and have a hope — which by this time cannot be called reasonable — that the landlord has built with a view to comfort. Not so; he builds with a view to money, and the tenant suffers every day of the year, because the simplest precautions have not been taken in building to meet the changes arising from variation in temperature. It may be wrong to blame the landlord, or even the speculative builder, when the right person to blame is the architect. So far as the outside world may judge, the profession of "architect" is, from first to last, a delusion and a snare. The only thing the "professor" is good for is to blackguard the Government (or municipal authorities) or private individuals, over every bit of work done. No work is ever done by the right person, or is well done. The latter is unavoidable; for what capitalist can decide as to the right party, or how can the man act freely when selected, when every other member of the profession is like a tom-cat, snarling at every design as a whole, and at every detail in the design? Who ever heard of an architect paying attention to common-sense suggestions in designing the miles upon miles of houses in the towns of England? And surely some architect has been consulted in the majority of cases. The aim is to make a something to look at from the outside, while comfort and convenience are of no import. — *Contractor.*

Taking down an Iron Mast. — An interesting and very difficult mechanical feat was performed in Akron recently, in the taking down of an iron electric-light mast 213 feet in height above ground. The mast was composed of fifty-five sections of boiler-plate, each fifty inches in length, and varying in thickness from one-half inch at the base, to three-eighths inch, five-sixteenths inch, one-fourth inch, and at the top three-sixteenths inch. The diameter at the base was three feet, and at the top eight inches. The entire weight of the plate removed was eight tons. A change in the system of street-lighting led to the abandonment of the mast, and the contract for taking it down and removing it was given to the Buckeye Machine Company, of Cleveland, whose efficient general manager and engineer, Mr. Ludwig Herman, had charge of the work. From the outset — the mast itself being bent out of plumb and in a dangerous condition — the task presented numerous and trying difficulties, but careful calculation, coupled with cool-headedness and superior engineering skill, were adequate to successfully grapple them all. The method of removal, briefly, was this: Around the lower sections of the mast, to a height of twenty feet, a staging was erected. This was composed of uprights 8″ x 8″, caps 10″ x 10″, sills 8″ x 8″, braces 2″ x 10,″ and struts 6″ x 6,″ all securely bolted together. From this staging, by means of chain-blocks and swivel-rods and peculiarly-shaped hooks which took hold under the lap of the successive sections, the mast was suspended, while the work of cutting the rivets and removing the sections was carried forward. The hooks in question were held in place by an adjustable band three inches in diameter. After cutting away the lower sections, the whole mast was lowered four inches at a time, the hooks shifted to the lap above, and the lower section cut out again. In this way the work proceeded, the mast being held by ten guys, the manipulation of which required the utmost skill and patience. At one time, during an adverse wind, the top of the mast swayed fifteen inches out of line, but close watching and careful management averted all accidents, and the entire task was successfully completed in a remarkably short period of time. For the first three days one section each day was removed; then three, five and twelve, and on the last day, twenty-seven. — *Iron Trade Review.*

Dwarfs in Central America. — Stories about diminutive people are found in many countries, not as of real beings, but shadows that come and go, and are called by various names, such as fairy, fay, elf, pixie, etc. Nowhere are such little people more talked about than in some parts of Central America, notably in British Honduras and Yucatan, where people little more than four feet high are very numerous, even at the present time. Whenever the natives are questioned about the ancient temples found in their country, they say "the pigmies built them," and, although no importance is generally attached to that answer, it is a strange fact that, on the east coast of Yucatan, as well as on adjacent islands, there are whole cities in ruinous condition, of houses that could not possibly have served for people more than three feet high. I have measured many of those houses, which are strongly constructed of hewn stone, and found the doorways not more than three feet high, and eighteen inches wide, while my head nearly touched the ceilings of the largest rooms. No one can dissuade the natives from the idea that the ghosts of those diminutive people roam about at night. They say, "But we do see them; they are not bigger than a child four years old, and they wear big hats; they throw stones at us, shake our hammocks, and hammer on the bench where we grind corn." It is affirmed that very diminutive people still dwell among the hills in Honduras and Guatemala, but no one seems able to put his fingers upon them, which would lead to the belief that, if there are any still living, as so many assert, they must be very few, and successful in hiding. Nevertheless, it is credibly related that one day, in the year 1825, some wood-cutters, wandering along the banks of the Moho River in British Honduras, in search of mahogany trees, were startled upon reaching a place called Meditation Fall, by a strange little being that suddenly emerged from the bush, stared wildly at them, then turned to flee. The men pursued, overtook, and brought the odd creature to their camp. It was a dark-skinned girl, not quite three feet tall, and with no other covering than her hair, which fell in thick black masses to her feet, completely covering her. She was very wild, but not stupid, and finding that no harm was done to her, she talked to the woodcutters in the Maya tongue that they also spoke, that being the language of the Indians in those parts. As the weather was cool, one of the men gave her a red-flannel shirt, which clothed her from head to foot. For a day or two she refused to eat, but afterward seemed contented. She said her people were all the same size as herself, and that they were then living near Meditation Fall, where they had planted a corn-field, but that they generally dwelt three or four miles away in a deep valley. After she had been in the camp about ten days, some of the men proposed to go and see her people. She manifested delight, and offered to guide them to the spot. Reaching the place where they first met her, she led them into the forest, then made a sign for them to stop and be silent. A hub-bub of voices, as of many people talking, reached their ears, and the girl whispered to them that she would go and announce their coming, as otherwise her people would run away and hide on hearing footsteps. Away she went, and soon not a sound was heard. The men waited patiently, but their diminutive guide did not return. Convinced that she had very cunningly eluded them, they went forward, and in two minutes found themselves in a cornfield. There were embers in two or three places, and small piles of corn, as if prepared for transportation. The ground was much trodden, but no living creature was in sight. They searched in vain, and remained some time in the field, hoping that the owners would return for the corn, but they never saw the girl again, nor any of her people. One of those very woodmen gave me this account, and similar stories have been told by others; but all such stories might be doubted, were it not for the cities of diminutive houses, which any traveller may examine for himself. — *Alice D. Le Plongeon, in New York Tribune.*

TRADE SURVEYS

The week's returns so far as made by architects and builders show a steadily improving condition of things. A great deal of work has been placed during the week all over the country. In many localities architects are withholding information as to details from prudential considerations, but say business in the building trades will be exceptionally active all through the season. The demand for houses, large and small, for shop-room, manufacturing capacity, and for public buildings is expanding, as is to be expected at this time. In manufacturing channels confidence is strong and growing. Mills and factories are operated generally on full time. Where capacity has been run in part it is being increased. Extensions are projected in textile, hardware, and some other industries. An extraordinary demand is counted on in all channels and ample preparations are being made to supply it. The labor agitations and the advancing cost of raw material are attracting more attention because of the possibility of a reaction in building, manufacturing, and railroad enterprises. Labor is meeting with success in restoring the reductions of the past two years and is pursuing a logical course. The reduction of the hours of labor is a more serious matter than an advance of wages. Employers have been taken by surprise, although having eighteen months' notice of the contemplated action. As heretofore intimated no serious results will follow. Equalizing agencies will protect all interests. The outcome of these two movements will be to give labor a more fixed value and will make reductions in the future more difficult. The partial division of authority will also serve to prevent wage fluctuations because of the interposition of arbitration. The building trades have arranged matters in nearly all States, and no interruption to existing friendly relations is probable. Building authorities naturally feel apprehensive in this transition from ten to nine or eight hours and from cheap to dearer materials; but so far no harm has been done, and fortunately none is in sight. The necessities of the country for more room are urgent and the people are able to pay the price of it. Cheap dwellings will be the feature of this year's work in cities and towns, especially in manufacturing centres. Profits on these investments range from ten to twenty per cent. Architects of national repute have recently stated that the impulse given to such investments will carry such construction to what might be regarded now as extreme limits. During the past ten days an unusually large number of permits were taken out in New York, Philadelphia, Cincinnati, and Chicago. Apartment-houses in the city of New York and fine country residences in the suburbs are occupying special attention of investors and architects. Real estate is also advancing in and near that city. The rather surprising statement has been made by some New England real-estate operators that in many manufacturing towns real estate has advanced ten to twenty per cent within a year. Much suburban real estate has changed hands in the West, and no doubt causes are working for a heavier movement of eligible building sites in and near the larger cities and towns. The improving tendency will in time arrest enterprise, but that is a far-off evil. Meantime the country is making wonderful progress. The Northwestern territory and some sections of the South are being fed by a steady inflow of manufacturing capital, expended in manufacturing, mining and railroad construction. Makers of railway material and appliances, and manufacturers of mill and factory machinery have, since March 1st, received orders of magnitude and are assured of additional orders from these sections. The existing demand for machinery is evidence of a very healthy industrial condition. Our New England works generally are working larger forces than last year and have better assurance for the future than at this time last year. The railway companies are obliged to buy now. Car orders are numerous and particularly for ore, coal, lumber and similar products. Machinists are busy, and makers of special machinery, electric-light appliances and of water and gas supplies are crowded with orders. It is reasonable to fear, or at least apprehend, curtailment of enterprise on account of dearer material, but the ability of the country to pay higher prices is being attested every day. Distributors of products speak of a little depression during the past few days. Failures continue in about the ratio of last year but liabilities foot up less. Risks are fewer and commercial footing is growing stronger. Builders have all necessary capital tendered them at fair prices, and buyers are making payments for purchased properties with promptness. The country is nearer the long-talked-of cash system than it has ever yet been, and every month strengthens the foundations of trade.

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THE MARKET-PLACE AND CHURCH OF SAN DIEGO, AGUAS CALIENTES, MEXICO.

HELIOTYPE PRINTING CO. BOSTON.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 534.

MARCH 20, 1886.

Entered at the Post-Office at Boston as second-class matter.

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THE first accounts of the sinking of the steamer Oregon suggests reflections of considerable interest from a technical point of view. Leaving out of sight the question whether eight men, all on the lookout at once, ought not to have been able to give sufficient warning of danger to enable the steersman to avoid a collision, there is something extraordinary in the amount of damage inflicted by a comparatively slight blow, as well as in the complete crippling of the structure of the larger vessel which occurred either before or just after her submersion. According to the published descriptions of the accident, the vessel which struck the Oregon could not have been sailing at very great speed, for all accounts agree that the sea was smooth, and the officers say that there was a mist, which, in the absence of rain, implies a light wind; while the shock of the collision was so feeble that few of the passengers were awakened by it, and there is no sign of the spars having been shaken out of the smaller vessel. For all this, the first blow was sufficient to knock a hole nine feet square in the side of the Oregon, while the second blow, which must have been a comparatively feeble one, since it came only from the recoil and subsequent slight movement of the schooner, broke through the Oregon again, at the very point where her side should have been most thoroughly stiffened by the transverse bulkhead, tearing a hole which opened into two compartments at once. The captain of the Oregon is said to have had no idea of the extent of the injury for some time after the accident, and to have continued his course for New York, sending down men meanwhile to stop the holes with blankets and mattresses, and one could hardly have better authority than his for thinking that the normal result of such a collision should have been far less serious than the damage actually inflicted. We cannot help suspecting that something of the responsibility for the accident ought to be laid upon the steel plates, of which the vessel, like most of the newer and larger ones, was constructed. There is, in the use of structural steel, a temptation and a danger, which are now just beginning to be thoroughly understood. According to present ideas a steel plate, to replace with advantage the wrought-iron plates of the old-fashioned naval construction, should contain so slight a percentage of carbon as to be soft, almost inelastic, and incapable of hardening by dipping, when red-hot, in cold water. Steel plates of this kind are, except for the difference in the process of manufacture, practically about the same thing as those of wrought iron, showing similar softness, toughness and strength, and it seems incredible that plates so made, and well riveted together, should be dashed to pieces by a blow in the way that the side of the Oregon seemed to have been demolished. A trifling variation in the manufacture of the steel plates, however, gives them properties of a very different character. A few more pounds of carbon in a ton of metal will make the plates rolled from it far stronger, stiffer, and more elastic, and only less suitable for naval construction by reason of the brittleness which they acquire in the ratio of their gain in strength. For some purposes the gain in strength is of great importance, a ton of steel plates of this kind easily doing the work of perhaps three thousand pounds of iron or soft steel, and in shipbuilding, where every pound of metal saved in construction adds an equal amount to the profitable carrying capacity of the vessel, there is an obvious inducement to use the stronger, but thinner and more brittle plates. Whether Messrs. John Elder and Company, the builders of the Oregon, were in the least imprudent in this respect, we cannot, of course, say, and their reputation is good evidence that they would certainly have used the material which seemed at the time the best for the purpose; but the ideas of engineers in regard to mild steel have somewhat changed since the Oregon was built, and the disaster off Fire Island may have been the first severe test to which a steel ship has been subjected. That it showed an unexpected weakness seems to be evident, and it is much to be hoped that an investigation may be made which will bring out all the facts from which instruction for the future may be derived.

ONE account of the catastrophe contains an important indication of another kind. According to this story, two of the masts of the Oregon, as it sank, approached each other until they crossed, showing that the vessel broke in two in the middle as it went down. The water at the place of the accident is about one hundred and thirty feet deep, and the bottom is probably sandy, like the rest of the Long Island shore, so that there would seem to be nothing in the way of a lodgment on two rocks to explain the rupture, and we must perhaps look for the cause in the transverse strain due to the weight of the water in the middle compartments, resisted by the buoyancy of the compartments at the ends, which were still filled with air. This strain might easily amount to a load of one or two thousand tons, which, acting at the centre of a structure more than five hundred feet long, it would require great strength to resist. Such strength ought, of course, to be supplied, since a similar accident might happen to any vessel, but the need for it is not often so clearly shown. Most steamships are very strongly trussed to resist "hogging," or transverse rupture by the weight of the two ends in case the vessel should be left supported only in the middle, but bracing against a strain in the opposite direction would be less frequently needed, and is not perhaps so carefully attended to.

AMONG the circulars recently issued by the United States Bureau of Education is one containing an account of the principal technical schools abroad, by the late C. O. Thompson, once the noted Principal of the Worcester Free Institute, and later President of the Rose Polytechnic Institute at Terre Haute, Ind., which contains much information of value to those interested in technical training. The point which first attracts the attention of the reader of the pamphlet is the change which has taken place in European schools in regard to the method of teaching such arts as those of engineering and architecture. A few years ago such things were taught as matters of science, in the great polytechnic schools of France and Germany, the courses in these schools consisting of lectures in every branch of the science of construction. The graduates of the schools went out into the world equipped with the Theory of Elasticity, the Method of Least Squares, Spherical Astronomy and Higher Geodesy, only to find that nobody had any use for them or their science. In 1881, there were in Germany one thousand graduates of the Polytechnic schools who could not find situations, and one manager of a large engineering establishment is said to have put up in the window of his office a card, inscribed "No Polytechnic man need apply."

A LITTLE before this time the Russian Government had established two engineering schools, one at Moscow and the other at St. Petersburg, on a new plan, under which each student was obliged to spend a large proportion of his time in what has now become familiar to our teachers as "shop-work;" which, in the courses of mechanical engineering.

consisting in the practice of forging, casting, drilling, filing, fitting, pattern-making and assembling of parts of machines. This innovation in technical instruction met with a success which soon attracted notice among civilized nations. While only two thousand students attended the German Polytechnic schools, which were arranged to accommodate six thousand, and out of those who did go, only a portion found their services in demand after their graduation, the Russian schools were well filled, and their graduates were profitably employed as soon as they were ready to go out into the world. The attention of all who cared for technical education was soon fixed upon St. Petersburg and Moscow, where they saw not only lecture-rooms for the teaching of theory, but great workshops, where, in the mechanical engineering department of the St. Petersburg school alone, several tons of iron were cast every day by the students, steel was made in a Bessemer converter, and wrought-iron produced by puddling processes carried on at a considerable scale. In the department of applied chemistry in the same school they saw a distillery capable of producing a thousand gallons of alcohol a day; soda works with a capacity of a thousand pounds a day, and a dye-house supervised by the best dyer in Russia, where a hundred pounds a day of cotton, silk and woollen goods were handled under the direction of the students, who were obliged to take charge in turn of each of these model establishments. Returning to the engineering department, they found the materials produced in the shops utilized in various ways, one of the bridges across the Neva, for instance, having been entirely constructed under the direction of the engineering department of the Polytechnic school, out of iron tested, if not made, in the school premises. At Moscow, where the system of shop-work is somewhat different, although the proportion of the students' time devoted to it is about the same, an immense amount of machinery is made in the school workshops and sold, the sales of engines, lathes, drilling-machines, and tools of various kinds amounting to more than thirty thousand dollars a year.

SEEING these things, the people in other parts of the world who care for the happiness and usefulness of their fellow-citizens began to inquire whether, after all, the training of hand and eye, and the business-like habits, fostered by the Russian schools, where the students not only poured the melted iron into the moulds, and stirred the dyes in the vats, but bought the materials, tested them, and rendered strict accounts of their use of them to their professors, were not of value, independent of the scientific attainments of the pupils, and experimental schools, managed on a similar basis, were established in all civilized countries, including our own. In the Continental countries it was desirable to avoid competing with the great public Polytechnic schools already existing, the teaching in which probably costs more than in any other schools or colleges in the world, and the shop-work schools were established at first under the name of Foremen schools, with the object of training pupils to become expert machinists, foundry-men, carpenters, builders, dyers, weavers and so on. The success of these schools was extraordinary. In most of them the course, measured by our ideas, was very severe, the French ones, for instance, requiring six-and-three-quarters hours' shop-work and six hours of other school-work per day from each pupil, but the graduates found their services in such demand that their future was practically assured from the moment that they left the school with their certificate of faithful application in their hands. To most parents, who have had to work hard for their own living, and are anxious about the success in life of their children, this consideration is of very great importance, and instruction in shop-work has naturally become extremely popular all over Europe. Already one of the larger schools, the Higher Technical School at Chemnitz, has been raised to an official rank equal with a Polytechnic school, and instruction in small handicrafts is now given in many primary schools, while the city of Paris has in process of construction an immense group of buildings expressly for training young children in the manual arts which will best qualify them to become skilful workmen and workwomen hereafter.

HIS Highness the Hereditary Prince of Monaco, who is a scientific man of distinction, recently read before the Paris Geographical Society a paper upon the Gulf Stream, which we find reported in *Le Génie Civil*, and which is well calculated to upset the notions which have hitherto flourished here in regard to that mysterious current. To say nothing of the superstitions prevalent in New York, where a warm day in winter is accounted for by saying that the Gulf Stream has set in toward the harbor, while a cold season is laid to the diversion of the stream from its normal course, it has been generally supposed and taught that the Gulf Stream, issuing from the Gulf of Mexico, flowed with considerable rapidity in a north-easterly direction, passing Cape Cod at a distance of sixty or seventy miles, and striking out then into the open Atlantic, which it was supposed to traverse with a speed slowly diminishing, until a portion of it reached the south-western coast of Great Britain, passing thence to the Baltic, while the remainder, leaving the main body somewhere in mid-ocean, bathed the Azores, and lost itself on the African coast. A convincing proof of the correctness of this description was supposed to be found in the fact that the western, or rather the south-western coast of England, is remarkable for its mild climate, palms, orange trees, eucalyptus and many other sub-tropical plants flourishing there in the open air, while cocoanuts and similar products of warm countries are said to be occasionally cast upon the beach.

REASONABLE as this theory appears in the light of the facts, the investigations of the prince seem to show that it is erroneous. Instead of bathing with its beneficent waters the coasts of Northern Europe as far as Spitzbergen, as is generally supposed, the Gulf Stream, to use his words, does not cross the parallel of forty degrees north latitude, unless perhaps very slightly, until it reaches the Azores, and the warm water which produces the balmy climate of Cornwall and Devonshire is a superficial layer, which, carried probably by the wind, moves in a course parallel to the equator, more than five hundred miles distant from the nearest edge of the real Gulf Stream. There is some reason to think that a part of the warm water may come from the Gulf Stream, as an undefined eddy has been discovered on the northern edge of the latter, but the principal current is proved, by bottles set afloat in it, to move, after it reaches the middle of the Atlantic, in a direction rather southerly or southeasterly than in one which would bring it to the British Islands. Its influence upon the latter must, therefore, be confined to the tempering of the prevailing southwesterly winds, and as these are the rainy winds, every shower probably brings to refresh the English and Irish coasts some drops evaporated from the warm belt which crosses the ocean far to the southward.

WE trust we have not outraged the feelings of any of the many subscribers who have lately said pleasant things of our past endeavors, by printing extracts from their notes in the form of endorsements — so dear to the maker of proprietary medicines. We have taken this, with us, unusual course just now because we recognize that men like to have an opinion suggested for their adoption as much as sheep like to see the old bell-wether make the first skip over the wall; and as there certainly seem to be many who think our journal something more than merely tolerable, it may confirm others in the suspicion they have vaguely entertained, that it is good enough to be better, and that the best way to make it better is to aid actively in the work, when occasion offers. It is too soon for us to say whether the Imperial edition will be worthy of the very handsome support it has already received, but it may be well to advise those who may be disposed to grumble, that the difference between this and the other editions is cumulative, and the question whether it is worth what is paid for it should wait unasked till the end of the year. This matter of money's worth suggests the thought that it may be worth while to point out that the cost of little things, insignificant in themselves, when taken in bulk is enough to account for our not giving more for the money than we do. Thus, for instance, the increase of half-a-cent a pound in paper, or a change in the postal laws, might annihilate our present small profits on the subscriptions, or, to take a less conspicuous item, the steps we now take to mail this edition flat cost us about fifty cents more per subscriber than the old way. This means for the full list a gross sum of such magnitude that we could probably make a considerable saving by buying back from our subscribers at the end of the year the straw-board sheets in which the copies are mailed.

THE REPORT OF THE MASSACHUSETTS DRAINAGE COMMISSION.—I.



From the Alhambra, Granada.
(Rep. Cen. Soc. Archts. Paris)

IN 1884, in pursuance of a resolve of the Legislature, the Governor of Massachusetts appointed Messrs. Adams, Stebbins, Converse, Hayden and Tuckerman a commission to investigate conditions affecting the purity of certain rivers of the State and to suggest remedial measures. The commission employed Mr. Eliot C. Clarke as its chief engineer, and Messrs. Joseph P. Davis and Rudolph Hering as consulting engineers. It has recently issued an official report of two hundred and forty-three pages, giving the result of its labors.

The assumption is made at the outset that the rivers in question are seriously polluted by sewage and by manufacturing waste, the degree of pollution in the case of different rivers being duly considered. It is also assumed that the best way to get rid of sewage, when it can safely be adopted, is to discharge it into a large body of fresh water. It is assumed that this is not practicable in the case of the rivers in question.

One of the conclusions reached was that, owing to the impossibility of discharging the sewage directly into streams without first purifying it, it is necessary to exclude storm-water from it entirely. The commissioners say: —

"We do not provide for surface drainage. Situated as we were, it was found to involve a scale of cost which seemed to us entirely inadmissible. It may answer very well when sewage flows freely away into large bodies of water, but if it requires pumping, treating or handling in any form, the accession of rainfall swells the discharge at times to utterly unmanageable proportions and in any aspect is very costly and cumbrous. We think that the figures which we have to present will be sufficiently imposing without one dollar of needless expenditure. In our view the treatment of street scour as sewage is a luxury rather than a necessity of municipal life, and it seems to us that most of our towns and cities find that their necessities will probably absorb all the funds which they are quite ready to spare."

The prevention of the pollution of streams by the waste of manufacturing establishments is properly regarded as only incidental to the chief purpose of this commission, which is to prevent access of foul or of partially purified sewage to streams from which water is taken for domestic use. This element of the problem is divided into three parts: 1. Relating to towns of which the sewage may be delivered through a common sewer to one common area for purification. 2. Relating to towns of which the sewage may be delivered by a common carrier into the present main outfall system of the City of Boston. 3. Relating to towns of which the sewage must be treated independently, each by itself, or in small groups.

The largest example of the first method is the system proposed for the Mystic River valley. This is to take the sewage of the whole or a portion of Stoneham, Woburn, Winchester, Medford, Belmont, Arlington, Cambridge, Somerville, Melrose, Malden, Everett, Chelsea and Revere, by a sewer which at its lower end is five feet in diameter, with an inclination of 1 to 2,500. This sewer is to deliver at a pumping-station near Pines River in Saugus, where there is a tract of more than 1,000 acres, which may be made available for its treatment. The sewage is to be pumped on to this land and filtered through it, the effluent being discharged a little below the level of half-tide, reaching the sea through Pines River.

The cost of this scheme is estimated at $1,520,000, the interest on the cost of construction at three per cent being $45,600 and the annual charge for maintenance being $20,000. This combined yearly charge is apportioned between the different towns in various amounts ranging from $449.85, in the case of Somerville, to $16,522.44, in the case of Chelsea.

The largest example of the second method is that of the lower Charles River valley for the disposal of the sewage of Waltham, Newton, Watertown, Brighton, Charlestown, Somerville, Cambridge, Brookline, and part of Boston proper. The main sewer of this system has at its lower end a diameter of six feet six inches and an inclination of 1 to 2,800. It delivers into the Boston main sewer at Huntington and Camden streets. Its cost is estimated at $1,561,000, with a yearly charge for maintenance of $12,000 and for interest of $46,830. To this is to be added an annual payment of the City of Boston for outfall and pumping of $29,650. These costs — in all $88,480 — are apportioned at rates varying from $1,265.06 for a part of Boston proper, to $26,288.21 in the case of Cambridge.

A characteristic example of the third method is to be found in the case of Westborough, where it is recommended to construct a main sewer of fifteen-inch pipe with an inclination of 1 to 1,500 crossing a divide in Park Street by an excavation about twenty-one feet deep and running westerly to a gravelly knoll of about fifteen acres extent, the highest point of which is about seventeen feet above the general level of the adjoining meadow. It is proposed to grade this down by the removal of 33,000 cubic yards of gravel, establishing a level area of ten acres about six feet above the elevation of spring freshets. This land is to be divided into four separate beds to which sewage can be delivered alternately. The cost of the scheme is $45,210. The charge for interest at three per cent would be $1,356.30. No estimate for the cost of maintenance is given. It is proposed that the City of Boston shall contribute $15,000 toward the execution of the work.

The total cost of all the improvements proposed is $3,771,381, on which the yearly interest at three per cent would be $113,141.43.

Concerning those districts which cannot be drained to the Boston main outfall it is assumed that the only admissible process for purification is what is known as intermittent filteration.

Chemical treatment is discarded because of its inefficiency and excessive cost. Broad irrigation or "sewage farming" is discarded because of the large area required and because of the objection to the undertaking of farming operations by a municipality. The commission expresses its objection to chemical treatment as follows:

"It is also the general opinion that chemical processes in their best form will have some effect in removing noxious matter in solution, but all agree that a considerable amount must be left in the effluent. This, however, may be safely discharged into a running stream, if its proportion to the supply of pure water does not exceed five per cent. But we have still to deal with the precipitate — about fifty grains, we will say, to the gallon. It is very offensive, and not valuable. By subjecting the sludge to methods of pressure, however, most of the water has been expressed without offense, and its weight reduced to about one ton to one hundred and sixty-five thousand gallons of sewage. It is possible that some market-value might attach to this residuum in some localities, but we dare not count upon anything better than gratuitous removal. Finally, the cost of the operation in England is estimated to be just about one shilling per head, or say, twenty-five cents for each person yearly. This does not include interest on the capital invested in the works, land, and so on. By itself, therefore, it does not appear to be financially attractive."

[The cost in England would have to be doubled in calculations for this country.]

Of irrigation it is said that when it is especially favored by circumstances it is the best method, but that it is seldom that these circumstances can be controlled to advantage. The process is thus described:

"By this process, the sewage being conducted to land prepared for the purpose, is suffered to flow over it and be taken up in part by the crops raised upon it. In short, it is an attempt to extract the element of value from the sewage by using it as a fertilizer in farming. The noxious and offensive elements are thus either beneficially appropriated by crops, or are detained in the soil by mechanical filtration, or by long and repeated exposure to the air are decomposed, oxidized, and changed into harmless matters, so that the water which runs off is comparatively pure. More than one hundred towns in England employ this system, and it proves eminently satisfactory where conditions favor its adoption. Its great drawback is the vast area of land required for its successful operation on a large scale. It is stated, for example, in our engineer's report, that Boston would require a farm about as large as the entire township of Brookline, if it wished to realize the whole farming value of its sewage. The best English authorities estimate that one acre of land must be set aside for each one hundred persons. When it is remembered that this land must all be tolerably level and fairly dry, some appreciation is reached of the obstacle which this incident presents to the general adoption of this system. There are subsidiary difficulties which will naturally occur to all. It suggests alarming possibilities of farming on a large scale, by municipal corporations. This prospect may well damp the enthusiasm of many who would eagerly welcome such a solution of the sewage problem, if sufficient private farming enterprise were available upon tracts of land convenient and adapted to the purpose. . . . Dry or wet, night and day, summer and winter, the same quantity must be taken, or if there be any variation, it is likely to be most when the crop needs it least. And it is this obligation which we fancy would dismay our farmers. But in the absence of such a private demand, it is difficult to see how the work can be carried out without the direct intervention of the municipality. . . .

"In fine, we believe this system to be admirable, if only a number of somewhat intractable conditions, some of which we have indicated, can be controlled. Where all things can be made to work together in harmony, it offers a reasonable probability of at least reducing the expense of getting rid of sewage to a minimum. Where an arrangement can be made to operate it in combination with filtration, so that private agriculturists may take the sewage in such quantities, and at such times, as they may find best for their crops, and, when not desired, can turn it upon filter-beds, we think there would be a fair prospect of attaining the largest measure of utilization with the least possible complication and expense."

The method finally selected for recommendation is what is called in England "Intermittent Downward Filteration." The advantages

of this system are so well stated in the report that it would be impossible to improve on the instructive text:

"Intermittent filtration, pure and simple, is the converse of irrigation. The latter is the minimum quantity of sewage applied to the maximum area of land, and permits utilization, as well as purification, to the greatest degree. The former is the application of the maximum quantity of sewage upon the minimum area of land. It permits of only partial utilization, but, in our opinion, of more perfect purification.[1] It frankly abandons all dreams of profit; and in so doing it gets rid of the two greatest drawbacks to the system of irrigation. Having no crop to consider, much less land will suffice, as it is found that the ground will filter ten times as much sewage as any crop upon it can profitably absorb. Having no farming ventures at stake, we are relieved of all the machinery of trade and difficulties of management. Purification, not profit, is the paramount idea. Not that it is impossible, in certain cases, to combine some profitable use with this primary intention, but if so, it is a purely secondary consideration. This system is, in effect, nothing but turning certain tracts of suitable land, by skilful preparation, into monstrous filters. There is, properly, no attempt to save any matters held in suspension or solution in the sewage. The object is to get clear of them utterly, whether they be good or bad, precious or worthless, and restore the water to its first estate, pure and undefiled, as it bubbled from the spring. And this wonderful transformation is constantly asserted to be brought about by a faithful application of the filtration process. Its advocates maintain that sewage, passed through ten feet of prepared earth, is good enough for any purpose, and they claim it to be nature's process, and intimate that, after all, it is a mere question of a little more or less remoteness, and every drop of water on earth to-day was sewage not long ago. However that may be, it is sufficient for the present purpose to say that, if properly managed, it does afford a practicable, economical and efficient means of cleansing sewage. The objections to it are five-fold. It is charged to be wasteful, in that it feeds no crop. There is a dread, lest so much sewage on so little land should cause offense, especially in midsummer. Doubters are confident that the land must eventually clog. And finally, it is thought that the cost of the preparation of the land will be excessive, or that the carelessness to be bargained for with ordinary management on a large scale, would render its success utterly problematical. The final arbiter of all such questionings is experience, and that infallible test has decided that these fears are, for the most part, groundless. . . .

"We have, then, no hesitation in recommending the adoption of this system, where, for any reason, broad irrigation is impracticable or undesirable and the ocean unattainable, and we think it likely to prove always a valuable auxiliary, in combination with irrigation, where the surroundings admit of its introduction."

The Commission says, at another point: —

"It almost seems as if earth, at a touch, took every baleful element out of sewage. We wish to emphasize this immunity from all essential pollution to air or water in the neighborhood of such lands, because it is probable that such an apprehension may be aroused at the outset, and it is possible that such baseless fears may be instrumental in prejudicing a feature of the scheme which seems to us to offer a singularly fortunate escape from a very perplexing dilemma."

However, when it comes to its recommendations it does not trust the touch of earth to destroy the baleful element. It says, in connection with Waltham, that filtration might be objected to on the score of danger from the returning effluent to the water supplies of Waltham and Watertown. Again, it says: "Any sewage field which might be fixed upon should not even filter in the direction of streams which supply water for drinking." In the case of Marlborough, it is proposed to spend about $22,000 for the sake of reaching remote ground, more than would be required "to reach another equally acceptable were it not for the fact that the effluent from the nearer of the two might affect the Boston water-supply." It recommends that "In Westborough as in Marlborough some additional expense should be faced rather than to run the risk of mixing the results of a possibly imperfect filtration with the drinking-water of any community."

This consideration is never lost sight of by the commission nor by its engineers, and upon it are based most of the recommendations made with reference to all those parts of the district which cannot drain to the Boston outfall.

The general theory on which the recommendations are based may fairly be formulated thus:

1. Unless where access to tide-water can be given in an unobjectionable manner, the sewage must be purified before it enters any stream.

2. Purification by chemical means would not be complete and would cost too much.

3 Broad irrigation when properly controlled secures a perfect effluent and an agricultural advantage, but it would take too much land and would involve the undertaking of farming operations by municipalities. If not always properly regulated it might result in the discharge of crude sewage over the surface into the stream.

4. Intermittent filtration is not subject to these disadvantages, it may be supplemented by irrigation to any desired extent, and its result is perfectly satisfactory.

5. However, to make assurance doubly sure, to avoid an infraction of the statute requiring sewage to be kept out of streams used as sources of domestic supply, and to see that no unrecognized and unsuspected "virulent poison from a previous sewage pollution" shall enter the water-supply rivers, even intermittent filtration areas must, wherever possible, be moved over beyond the edges of the water-shed and made to drain into some stream not now under the ban of the statute.

6. As the protected water-shed is so large, as the towns are so thick and growing so fast, it is not wise to attempt the purification of their effluent near at hand. So far as possible their sewage should flow into trunk lines and be carried to remote points, as to the Saugus Plain.

7. As the sewage will have to be carried through a costly main sewer, pumped at its point of destination and filtered through earth, everything except sewage must be kept out of it. The luxury of treating other waters would be too expensive.

This formula has been adhered to as closely, as carefully, and as consistently as the nature of things would allow. All of its details have been worked out with indefatigable pains and with great skill and at much cost. If we accept the formula as correct, sufficient, well founded and controlling, no question can be raised from any side as to the satisfactory and conclusive character of the work done.

There is perhaps a point of view from which some details of the scheme, details enormously affecting its completeness and its efficiency, take a somewhat different aspect.

First of all, it is not pleasant to give up our reliance on the good old motto "*Divide et Impera*," which has so long been the watchword of the sanitarian. It has generally been supposed that the more closely the details of cleansing work come under the control and are made to impose their burden upon those producing the waste, the more economical and the more complete might be the result. Under the scheme proposed, it would be at least a matter of indifference to the people of Winchester, for example, whether they sent much or little sewage for transportation through the main sewer, and to be pumped for purification in Saugus; so it would be a matter of indifference to the people of Waltham and Watertown whether they contributed much or little of the flow to be delivered through the Boston main and pumped at the outfall station. This consideration might seriously affect the magnitude of the problem. Again, there is nothing more rare than a tight sewer, and in many of the towns to be drained the sewers pass through saturated subsoil. That is, they would act as underdrains, and the amount of subsoil water contributed, greater in some places than in others, would, probably, at certain seasons — and these the worst seasons for purification — amount to a very important factor. Then too, it is very well to say that these outlets are provided only for a separate system of sewerage throughout the whole district to be relieved; but who is to regulate this and how exactly will it be regulated? It would be easy, no doubt, to prevent the connection of surface openings in the streets. It would not be easy — at all events for those who control the general system — to police the many towns connected so frequently and so thoroughly as would be necessary to prevent the clandestine discharge of roof and yard water through house-drains, and an enormous volume from this source would come to flood the purification-field at the time when it would — from rain falling directly upon it — be least able to receive sewage.

These considerations suggest a difficulty of great magnitude. It is found in England that where the "separate" system is used there is a very great increase of flow during rain-storms, and from underground drainage after rains. Bailey Denton says, with reference to Great Malvern: "The sewage proper, measured by the water-supply, amounts to 150,000 gallons a day, but in looking to the dilution due to subsoil water which raises it to 350,000 gallons a day, etc." In Abingdon, the sewage discharged in dry weather amounts to 200,000 gallons "increased to double that quantity in wet weather, the excess being due to the fact that the private sewers communicating with the public sewers in the town receive the rain run off the back roofs and impervious surfaces connected with the house."

Therefore, in regulating the scale on which these works are to be constructed, attention must be given not alone to present and future population, but to the increase of subsoil water leaking into the sewers and of roof and yard water clandestinely introduced into them — a very uncertain element of the calculation. However great it may be, an addition must be made to it to provide for the infiltration of soil water *en route*, especially after the main sewer dips below the permanent water-table of the ground. All this foreign water introduced into the sewers becomes foul water and must be treated at the same cost with the much smaller volume of actual domestic sewage provided for.

[To be continued.]

Mengoon, Burmah. — A few miles from Mandalay is the town of Mengoon, which is celebrated for its huge ruin of solid brickwork, formerly intended for a gigantic pagoda, but which was left unfinished in consequence of a prediction that its completion would be fatal to the royal founder, King Mentaragyi. The earthquake of 1839 split the huge cube of solid brickwork and reduced it to ruins. Yule gives the dimensions of the lowest of the five encircling terraces as 400 feet square. If completed, the edifice would have been 500 feet high. Not far from the gigantic ruin is the "great bell of Nungoon," cast at the commencement of this century, and in shape and form resembling Western bells. Its height is 18 feet, besides 7 feet for hanging apparatus; it is 17 feet in diameter, and from 10 to 12 inches in thickness, while its total weight is supposed to exceed 200,000 pounds. — *Springfield Republican.*

[1] This opinion is not well founded.

ART IN PHŒNICIA AND CYPRUS.[1]—I.



TWO installments of Messrs. Perrot & Chipiez's great history of ancient art have already been reviewed in these columns — those which dealt respectively with the art of Egypt and with the art of Babylonia and Assyria. A third installment is now before us, its English dress supplied by the same competent hand to which from the first we have been indebted. As its subject is merely the art of Phœnicia, and of its independencies and offshoots, it may seem a little strange that the book should be as voluminous as either of its predecessors.

Certainly, if the intrinsic interest of existing relics were the only point in question, a small fraction of the space required for Egypt or for Mesopotamia might have sufficed our authors. Neither in the quantity nor in the quality of such relics does Phœnicia even remotely rival the great nations of the farther South and farther East. But the present work is a *history* of art, and not a mere commentary on existing works of art. And to the historian's eye Phœnicia wears a very different aspect than the one she wears to the eye of the art-lover, pure and simple. The historian must take account not only of technical processes and visible concrete results, but also of origins and influences and all shaping causes. What may once have existed, but has now disappeared, may be of equal value in his thought with the most perfectly preserved specimens that still are to be seen. And how and why an art developed, how and why it was moulded by arts which went before, how and why it moulded those which came later upon the stage — these are the most vitally important points. And as the centre of our author's complicated and extensive scheme is avowedly the art of Greece — is an explanation of its roots and its nourishment as well as of its final, completest flowers — the art of Phœnicia gains a right to far fuller consideration than its own intrinsic merits at all could warrant.

Not that Phœnicia herself or any of the lands or cities which owed to her the whole or the greater part of their civilization, had the same sort of influence upon Greek art as had the art of Egypt or of Mesopotamia. These countries originated the elements which the Greek artists worked into shapes apparently so different and certainly so much more beautiful and complete that their origin was long forgotten or ignored; while Phœnicia originated nothing. "In a true sense of the word," M. Perrot explains, "we can hardly say that Phœnicia had a national art. She built much and she sculptured much, so we cannot say she had no art at all; but if we attempt to define it, it eludes us. Like an unstable chemical compound it dissolves into its elements, and we recognize one as Egyptian, another as Assyrian, and yet another, in later years, as purely Greek. The only thing that the Phœnicians can claim as their own is the recipe, so to speak, for the mixture. We may point, besides, to certain special arrangements suggested by special wants, such as those which have to do with the construction of fortified enclosures and the arrangements of harbors; and to a few singularities of style which are to be explained by the peculiar properties of the materials used. But these are only matters of detail. Looking at it as a whole, one is tempted to conclude that the sole originality of Phœnician art lies in its want of that quality."

M. Perrot then goes on to explain that with industry, as distinct from pure art, the case stands otherwise. To this point we shall return later on; but what we must first understand is why, if it had no original art, Phœnicia has so strong a claim upon the historian in whose eyes all ancient art is but one great whole with the art of Greece as its culminating blossom. It is because though the Phœnician was no originater, he was the great transmitter of original and diverse ideas; because if he did not directly influence the art of Greece, he conveyed to her those Egyptian and Assyrian influences without which her development must have been far other than it was — might never have been a development of anything like equal power and brilliancy. Indeed, more than this is true. It was not only the *art* of the South and East which the Phœnicians took to the barbarious shores of Greece; it was the whole *civilization* of the South and East — it was the knowledge of wealth and luxury and intellectual life; it was the impulse to rise out of barbarism and to develop hitherto unappreciated powers in each and every direction. Without contact with the outer world no such development would have been possible, and except for the help of the Phœnician mariner it is hard to see how such contact could have been brought about. If it would be too much to say that without his help Greece never would have been civilized, it is by no means too much to say that without it she would certainly not have been civilized when she was nor as she was. And the possibilities of loss to the world which lie in such a supposition bring with them such a rush of gratitude toward the Phœnician trader that we forget his own lack of intrinsic, artistic interest and gladly acknowledge his right to the prominent place which our authors have accorded him in the great gallery of ancient artistic history. And when I said that he brought nothing of his own to Greece, I forgot for a moment one thing which he did bring and which was indisputably his own — that priceless engine of civilization which we call the alphabet. He has left us no poetry, no philosophy, no history of his own; but he invented and bestowed the instrument by means of which Homer and Herodotus tell us of him, and by means of which the poetry, the philosophy and the history which tell of the Greeks themselves were rendered possible and were transmitted to the later world for its perpetual delighting and, no less, for the perpetual shaping and developing of its mind and heart. Not as an artist in any branch, I repeat, but yet as the great transmitter and unconscious foster-father of art does the dim, prosaic, money-making figure of the Phœnician mariner claim our attention and command our utmost gratitude.

From all of this it will perhaps be guessed that these present volumes, while of the greatest historical interest and importance, have far less artistic interests and charm than had either of their predecessors. A mere glance at their illustrations will prove as much. Few, indeed, are the pictured objects which can rival in the remotest way those forms of beauty and of strength that were portrayed in the earlier books. Yet most of them are extremely curious and extremely instructive, while quite as much can be said for every page of the text. And text and pictures alike have the essential charm of novelty; for with the exception of its Cypriote phase Phœnician art is a subject which, until this book was published, could only be studied in volumes which, like the great work of M. Renan, are inaccessible to the general public.

Perhaps I need hardly say, then, in arrangement the book is as clear, and in treatment as sensible and as charming as the earlier volumes. It begins with the same general summaries as to origin, physical conditions, religion, writing, etc.; speaks then of architecture in general and of its different branches in detail; next of sculpture; then of Cyprus and Cypriote art; of gems; of painting; and finally, at considerable length, of those industrial arts in which, as has been hinted, the Phœnician race produced results of greater originality and intrinsic interest than in the nobler branches.

We need not pause, I think, over the origin of the race — a matter still in dispute among authorities — further than to say that M. Perrot grants it that Semitic birth, which is proclaimed by affinities of language, but which seems to be thrown in doubt by the essential unlikeness of their religion to the Hebrew. Certainly, if analogies of character and history go for anything in the way of proof, the unlearned observer will hardly doubt a close relationship in blood between the Jew and the Phœnician. Strange and striking indeed are the parallels which might be drawn between the Phœnician in antiquity and the Jew in modern times; each a trader by nature and a traveller; each a dweller in every known land, and a controller of its commercial activity; but neither anywhere at home, anywhere at one with the native population; each always and everywhere an alien in language, in religion, in tastes and feelings, and aims and life. I cannot do better than quote, just here, one of the concluding paragraphs from the book before me: "Seeing how great their services were to the civilization of Greece and Rome, and how admirable were those virtues of industry, activity and splendid courage that they brought to their work, how is it that the classic writers speak of the Phœnicians with so little sympathy? And why does the modern historian, in spite of his breadth and freedom from bias, find it difficult to treat them even with justice? It is because, in spite of their long relations with them, the peoples of Greece and Italy never learned really to know the Phœnicians or to understand their language; and, to answer the second question, because our modern historians are hardly better informed. Between Greece and Rome, on the one hand, and Phœnicia and Carthage on the other, there was a barrier which was never beaten down. They traded and they fought, but they never concluded a lasting and cordial peace; they made no effort to comprehend each other's nature, but retained their mutual, ignorant antipathy to the very end. In later ages, when all races were welded into apparent unity under the hand of Rome, the same antagonism was manifested in a different way. It was to a Semitic people that the world owed a new literature and a new religion; but from the very day that the Bible conquered its final supremacy, the West began again to hate and persecute the Shemite. Between the two races there has been from the beginning of things both constant and fertile communication and perpetual misunderstanding. They have never been able to let each other alone, and they have never agreed."

"That full justice has never been done the Phœnicians," M. Perrot continues, "is partly their own fault. They were moved neither by the passion for truth nor by that for beauty. They cared only for gain. . . . Tyre and Sidon acquired prodigious wealth; the minds of their people were exclusively occupied with the useful; they were thinking always of the immediate profit to themselves in every transaction; and to such a people the world readily denies justice, to say nothing of indulgence." Indeed, I may add, to such a people the world cannot do justice, for it cannot know them. Unless a nation transmits itself to posterity, how can posterity be acquainted with it? And the sole and only transmitting power is *art* — art either in its literary or in one of its plastic forms. Mr. Matthew Arnold was not the first to tell us how all our civilization may be traced back to the Greek on the one hand, and to the Hebrew on the other, the former having dowered us with beauty in its widest sense, and the latter with righteousness, with truth. But, however great the Hebrew's passion for truth, it could never have been transmitted to us, we could never have credited him with it

[1] *History of Art in Phœnicia and its Dependencies.* From the French of George Perrot and Charles Chipiez. Translated and edited by Walter Armstrong. In two volumes, illustrated. London, Chapman & Hall, Limited. New York, A. C. Armstrong & Son. 1885.

could never have granted him "justice, much less indulgence," had he not been possessed of an almost unrivalled literary gift — had his love of righteousness not been embalmed forever in the pages of a magnificent literature of prose and verse. The Phœnician, as our author says, was as devoid of the passion for truth of his Hebrew cousin, as of the passion for beauty of the alien Greek. But even had he possessed it, it would have profited him little (I mean, of course, as regards our estimation of his qualities), unless the Hebrew gift for literary art had been given him as well. There are lessons here for us, I think, which we may well ponder with attention. And if it be objected that there was one great nation of antiquity which was not markedly artistic, and yet which shaped the world anew and conspicuously moulds our modern world to-day, let me explain that I am speaking of things purely intellectual and spiritual, and not of things practical and political; let me note, too, that Rome was not so inartistic by nature as was Phœnicia, and that she absorbed and re-edited a large portion of the art of Greece, turning it to her own new uses, and expressing by it much of her own individual life; and then let us remember that Rome, greatly as we respect her memory, commands respect, abstract admiration, rather than such affection as we give to Greece and to Judea; has a far less vital place in our conscience, in our intellectual life, in our emotions; supplies us neither with our "sweetness and light," nor with our "rules of conduct." These things, which were transmitted to us from the Greeks and the Hebrews, are the most important things of all — the most intimate, the most influential, the most precious. These will subsist, and will persist, with an influence ever new and ever freshly potent, as long as civilization of any kind remains — yes, even though a time should come when Rome herself will be forgotten. Even so there will never come a time — unless, I say, our civilization perishes utterly from off the earth — when the passion for truth which marked the Hebrew, when the passion for beauty which marked the Greek, will fail of its shaping, controlling, inspiring, delighting power. And each passion alike was recorded by the hand of art, has worked upon us, and will work upon our latest children's children, through the perennial power and charm which art, and art alone, possesses.

M. G. van Rensselaer.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE HALL MANSION, HARLEM, N. Y. SKETCHED BY MR. C. W. STOUGHTON, NEW YORK, N. Y.

This venerable and unique landmark of Harlem stands a little west of Fifth Avenue between One Hundred and Thirty-first and One Hundred and Thirty-second Streets, facing north and south, being consequently diagonally disposed to the avenue. In 1825, Charles Henry Hall, of England, purchased the Furman Farm of forty acres, with the old farm-house standing in its centre, and proceeded to secure the adjoining farms until his estate comprised two hundred acres, extending from Third to Eighth Avenue. He enlarged and remodelled the homestead, giving it its present form. A small army of workmen appeared, and all the resources of landscape gardening were employed on the farm, transforming it into a spacious park, from Mount Morris (One Hundred and Twentieth Street) to the shores of Harlem River. Artificial lakes were formed of fresh and of salt water, and stocked with fish; the finest cattle roamed over the pasture land, and everything that money could procure for beautifying the park was provided. A transverse road from Third to Eighth Avenue was cut through by Mr. Hall, paved and lined with trees — forming the present One Hundred and Twenty-ninth Street. From the verandas of the house one might look southward over the wide gardens and intervening meadows to the village of Yorkville, two miles below; eastward across Randall's Island to the Sound, and then following the course of Harlem River from the old Gouverneur Morris house of Morrisania Manor on the Bronx hills, to the northern highlands, where stands the Jumel House on the cliffs of Washington Heights. When all the proprietor's improvements were completed, his hospitality knew no bounds. Every one was admitted to enjoy the beauties of the park, while at the mansion balls and dinner-parties followed each other in quick succession; and all was animation and gaiety, with "life at the breaking crest:" night after night the lights burned late, and the spacious halls and rooms re-echoed the sounds of merriment, as had those of the Colonial houses, its older neighbors, which now, like it are falling to decay. The season at the Hall mansion was brilliant, but short, for its prestige passed with the generation which saw it rise. Its public-spirited builder was overtaken by financial difficulties in the panic of '37, and saw the elegant estate divided, and passing into other hands. In 1840, the house itself was sold and its glory became a memory of the past The fate of such a building in the city is inevitable, and though it still stands bare and dilapidated, its removal is only a question of time.

HOUSE OF G. N. TALBOT, ESQ., BROOKLINE, MASS. MESSRS. BRADLEE, WISLOW & WETHERELL, ARCHITECTS, BOSTON, MASS.

UNITARIAN CHURCH AND ALPHA DELTA PHI CHAPTER-HOUSE, ANN ARBOR, MICH. MESSRS. DONALDSON & MEIER, ARCHITECTS, DETROIT, MICH.

Both buildings are built in Ann Arbor, Mich., the cost of each having been about $15,000. They are both built of field stone gathered in the vicinity, broken and laid random range. In the Church, beside the audience-room are social rooms, Sabbath-school rooms, library, pastor's study (in second floor of tower), etc. In the Alpha Delta Phi House, basement and dining-room, kitchen, kitchen-pantry, stores, servants' quarters, fuel and boiler rooms, etc. In first story, parlor, library, smoking-room, reception-hall, matron's living-room and bed-room. Second floor, four suites (one-and-one-half bed-room and study), bath-rooms, closets, etc. Third floor, three suites and large chapter-room. Both buildings are finished neatly, though not extravagantly.

LIBRARY OF DREW THEOLOGICAL SEMINARY, MADISON, N. J. MR. R. H. ROBERTSON, ARCHITECT, NEW YORK, N. Y.

SKETCHES FOR COUNTRY-HOUSES. MESSRS. ANDREWS & JAQUES, ARCHITECTS, BOSTON, MASS.

ROTCH TRAVELLING SCHOLARSHIP DRAWINGS. — PLATES I, II, III, IV.

[Issued only with the Imperial edition.]

Although these sheets of drawings and sketches appear only in the "Imperial" edition, we have had so many inquiries as to the character of the task imposed on the contestants for this scholarship that we do not feel that subscribers to the other editions will object to our occupying a portion of their columns with the following programmes: —

A COLLEGE FOUNDED BY THE UNITED STATES GOVERNMENT TO TRAIN BOYS FOR POSITIONS IN THE GOVERNMENT CIVIL SERVICE.

This college is to bear the same relation to the civil service that West Point Academy does to the military service, and the Annapolis Academy to the naval service of the Government.

The institution is supposed to be situated in the City of Boston, on a level site, facing south on a new park, and having a frontage of not over 600 feet; on either side of the lot a street will extend to the north, and as much land in this direction can be occupied as may be desirable.

While expressing the purposes and the immediate uses of the structure, the design should have a monumental character, worthy of an important and permanent Government building.

The college will provide for 500 pupils. It is to include: —

Large hall for examinations and exhibitions, covering	10,000 sq. ft.
Reading-hall with book alcoves	5,000 " "
Gymnasium (with suitable outside recreation grounds)	5,000 " "
Refectory	5,000 " "
Kitchen, etc.	
General lavatories, etc.	
Coat-rooms, etc.	
Museum	10,000 " "
Physical laboratory	4,000 " "
Chemical laboratory	4,000 " "
Meteorological observatory	
Two lecture-rooms, each	6,000 " "
Twenty lecture-rooms, each	1,000 " "
Ten lecture-rooms, each	700 " "
Thirty instruction-rooms, near respective class-rooms, each	200 " "
Ample courts for light and air.	

A sketch is required of two elevations, two plans and one section, at a scale of 1-32 to a foot.

The rendered drawings are to consist of: — plan of each story; three elevations; one section; 1-8 scale. Portions of the façade at 1-2 scale.

The sketches are to be completed at 6 P. M., and left on the desks with an assumed name or motto on the corner of the sheets. They are to indicate as thoroughly as possible the *motif* or scheme the candidate proposes to follow, in plan and elevation.

Notice will be given on Monday, April 6, 1884, of the designs selected for the rest of the competition.

The finished drawings are to be handed in Friday, May 5, at 3 P. M. They must not depart from the original *motif* adopted in the sketch.

A MONUMENTAL RAILWAY TERMINUS FRONTING ON AN OPEN SQUARE.

This structure should include, besides the Railway Station, ample accommodations for the administration, for freight and passenger service, for a hotel, and for all other conveniences which can add to the comfortable arrival and departure of travellers. The architecture of the façade should be as imposing and rich in detail as is befitting the grand entrance to a great city.

The square may be given a monumental character by porticos, statues, and such other decorative features as would suggest the wealth and importance of the city. This square and station might be designed for such a site as the Cambridgeport flats, facing the West Boston bridge, and the latter might legitimately be considered in the design of the square.

The problem is to be regarded as a design for the arrangement of the square, and the plan will include only such portions of the buildings as indicate the façade upon the square.

The length of the façade must not exceed 500 feet; the limit of the square in the other direction is not fixed.

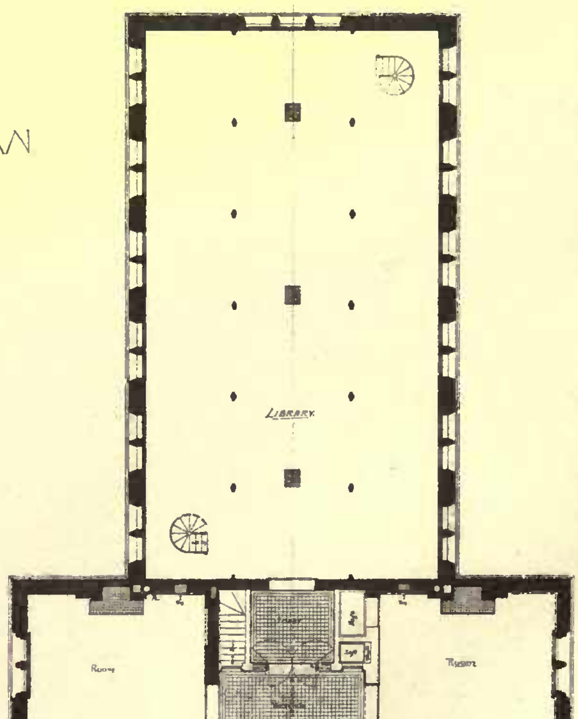
The preliminary sketch of the façade is to be on the scale of 1-32 to a foot; the plan of the square at 1-64 scale.

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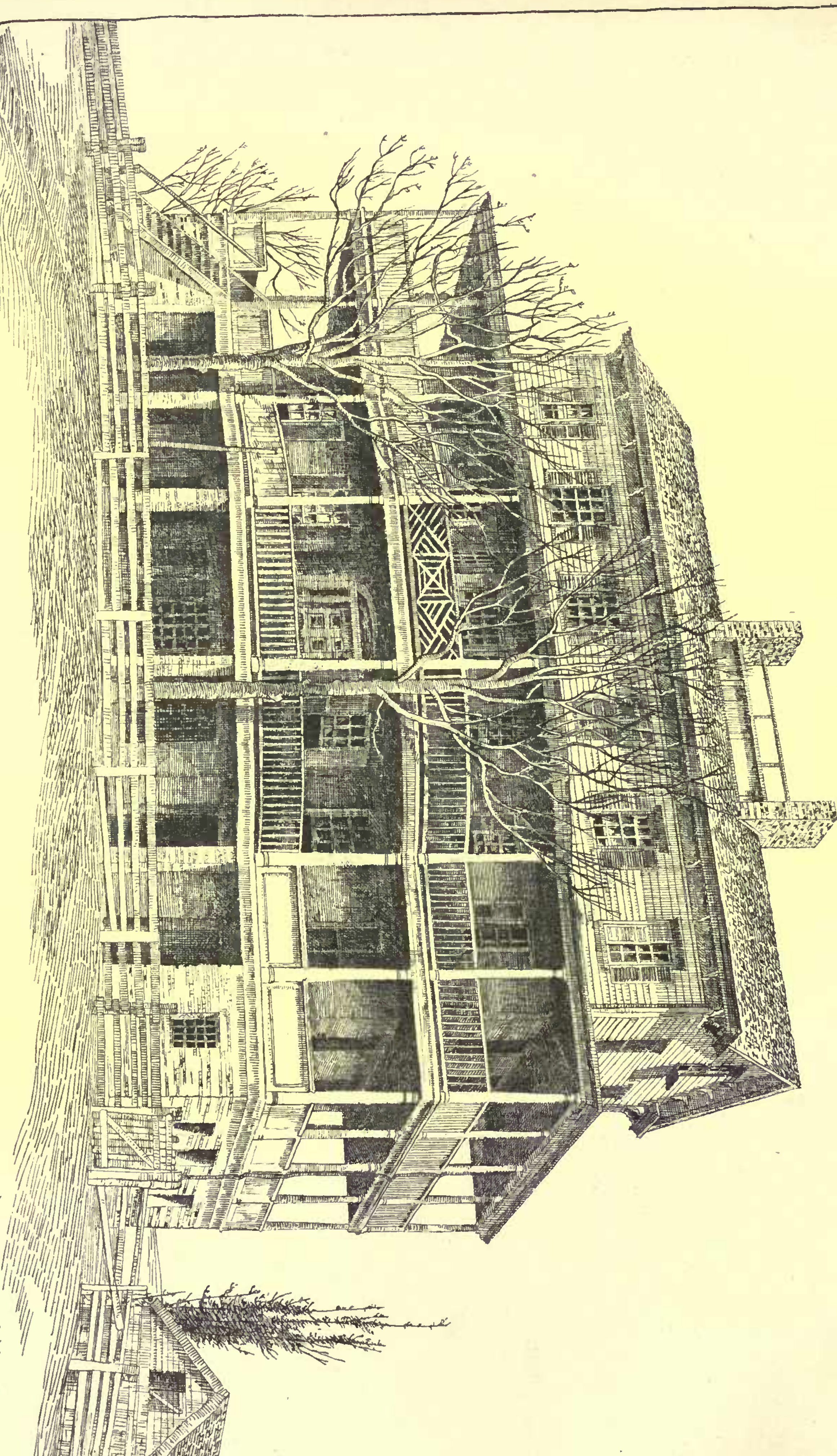
CROSS SECTION AND PLAN





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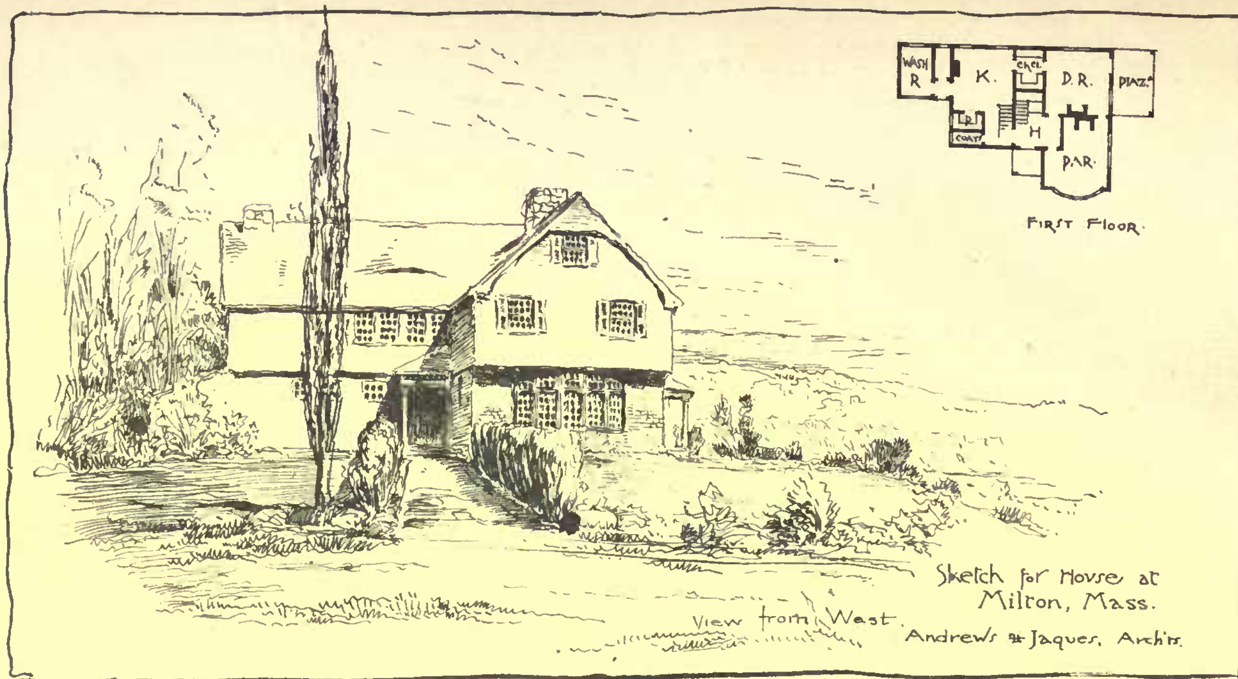


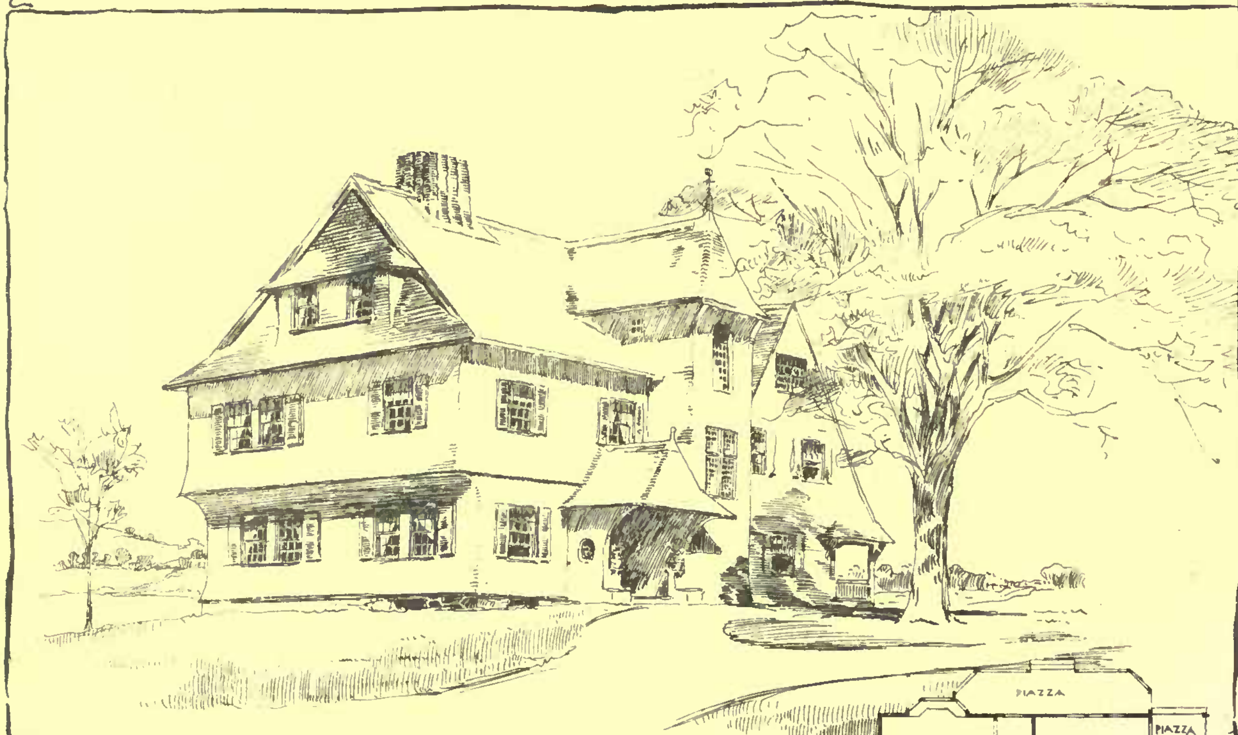
THE "HALL MANSION," NEW YORK.

DRAWN BY CHARLES W. STOUGHTON.

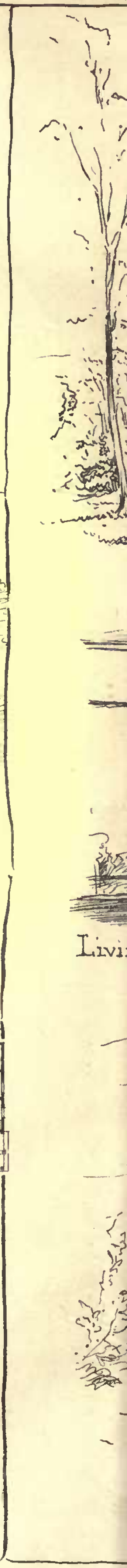
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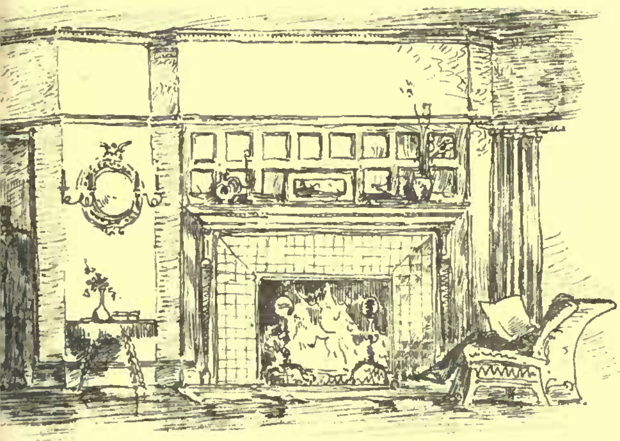


NOR & Co

Sketches for a House for J. H. Sawyer. Esq. Chestnut Hill Mass



View from Northwest



oom



Entrance Hall.

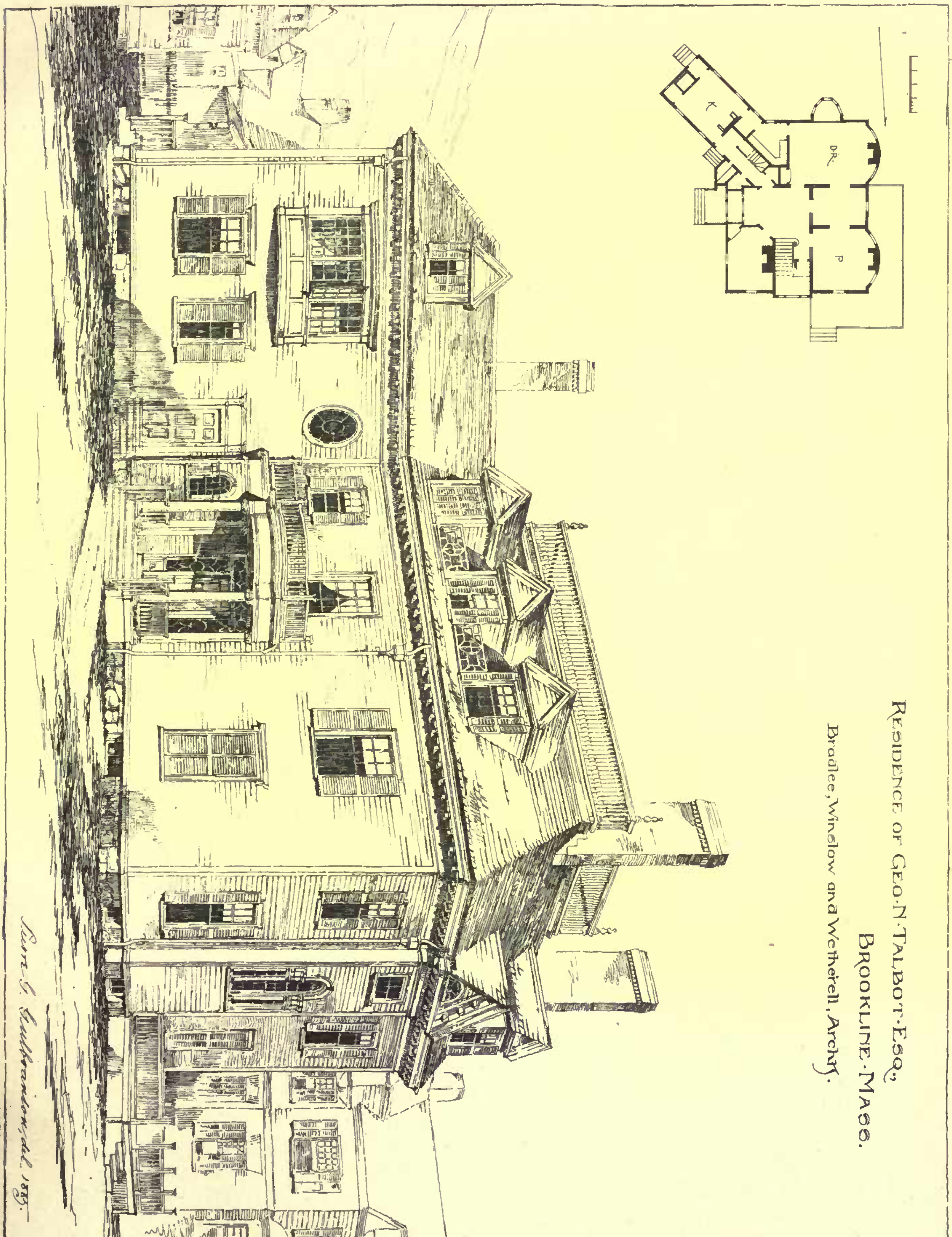


ew from Southeast.

Andrews & Jaques, Archts.
6 Beacon St. Boston. Mass.

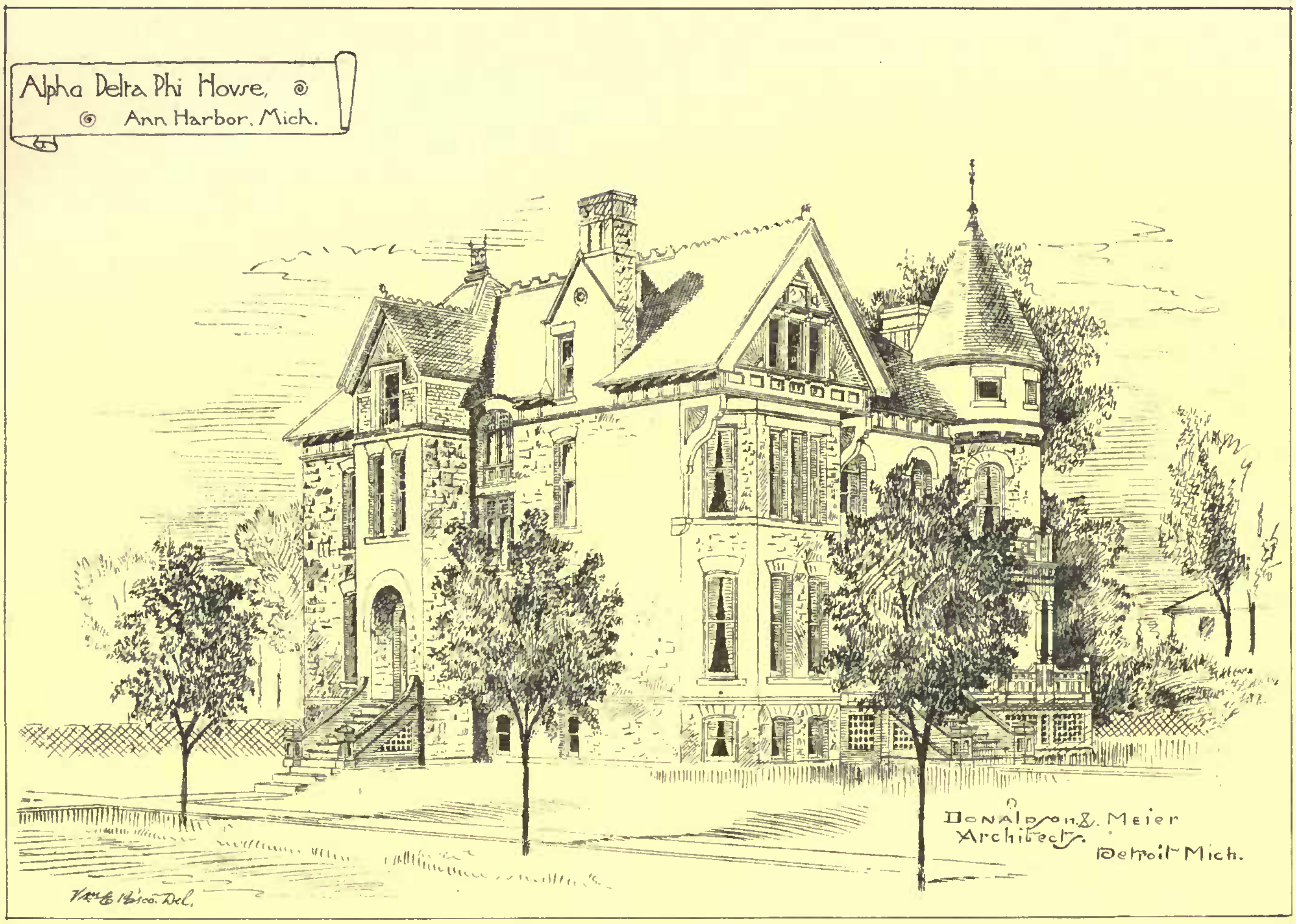
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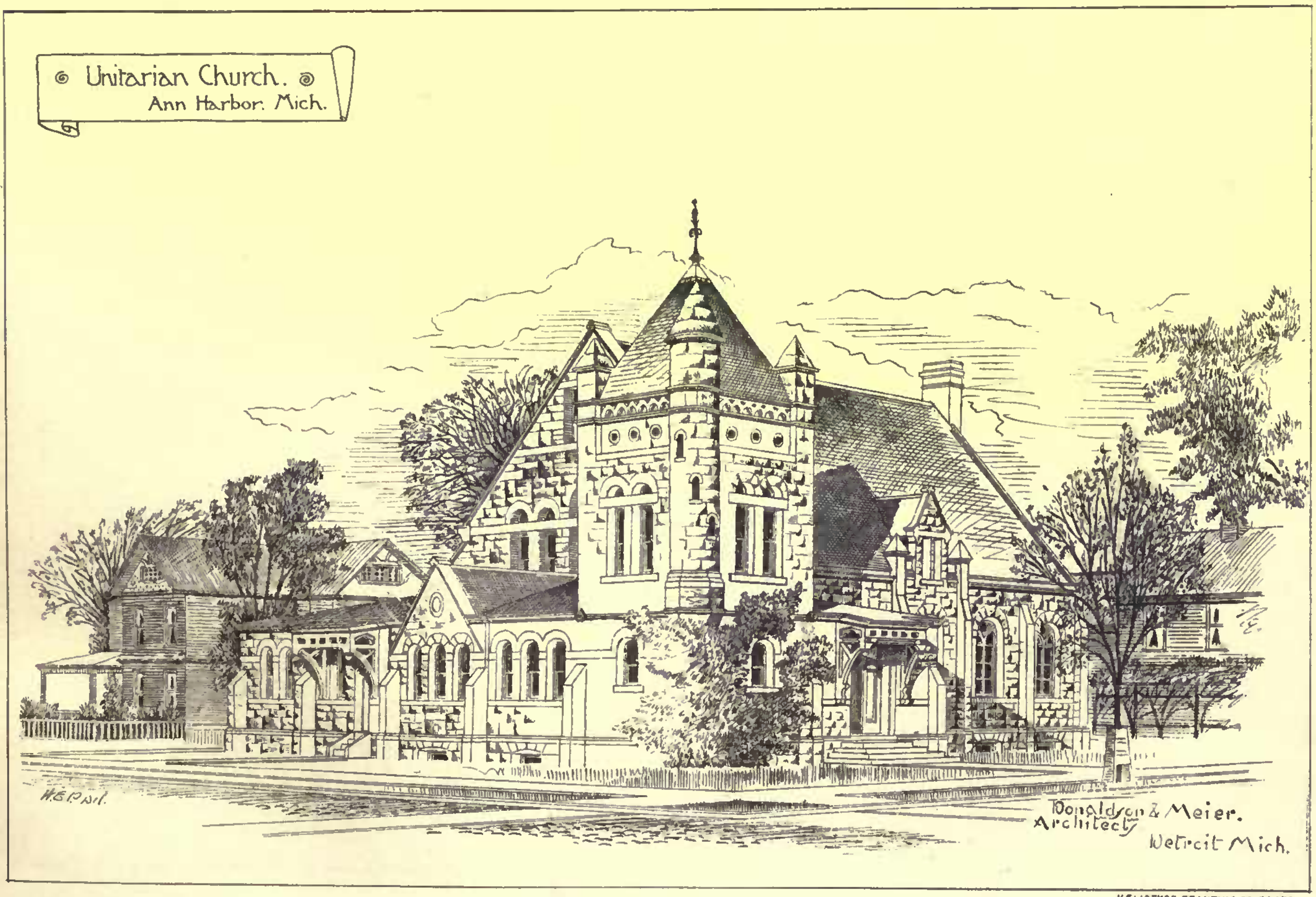
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RESIDENCE OF GEO·N·TALBOT·ESQ.
BROOKLINE·MASS.
Bradlee, Winslow and Wetherell, Archts.

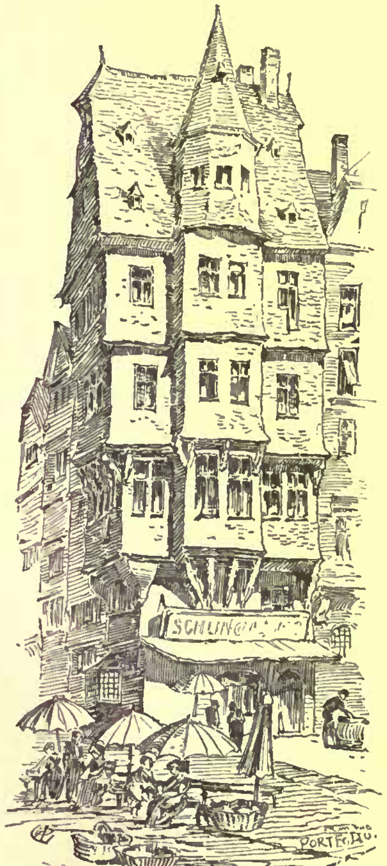
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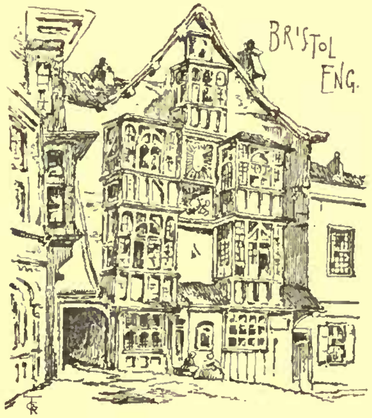


HELIOTYPE PRINTING CO. BOSTON





Old House, Frankfort-on-the-Main.











FOREIGN DOMESTIC BUILDINGS.

The rendered drawings required are:

A plan on a 1-16 scale; an elevation of the 500-foot façade washed with accurate shadows on a 1-8 scale; a perspective drawn in line, and not to exceed 14 by 18 inches.

The set of drawings must be accompanied by a thesis explaining the principles of architecture, historical and æsthetic, which governed the choice and development of the design.

The sketches are to be completed at 5 P. M. They are to indicate, as thoroughly as possible, the "motif" or scheme the candidate proposes to follow, in plan and elevation.

Notice will be given on Monday, April 6, 1885, which designs have been selected for the final competition.

The finished drawings are to be brought to the Museum on Saturday, April 18, at 4 P. M. Too great a departure from the features indicated in the sketch, will throw the finished set of drawings out of the competition.

MURAL PAINTING.[1]—VIII.

BYZANTINE FRESCO.



Seal from Mount Athos.

EVERYTHING that throws light on the evolution of mural paintings of bygone days is important. To know what were the agencies that caused one form of artistic expression rather than another, has a didactic value; and as the time-test is the only true test of the stability of pictorial processes, it is necessary that we should know just what these processes were, in order that we may be practically edified. On such grounds several lengthy extracts from the Manual of Denys will be justified. The discovery of this manuscript was fully chronicled in the last paper. Denys's Exordium is a beautiful and innocent orison to the Virgin:

"TO MARY,

"MOTHER OF GOD AND FOREVER VIRGIN.[2]

"O thou, who art as resplendent as the sun, much-beloved and all-gracious Mother of God, Mary! Saint Luke, source of eloquence, most learned physician, perfect master, and thoroughly versed in all the sciences and all knowledge, having been sanctified by the precepts of the Gospel—which he wrote and preached aloud—wished to declare to the whole world the very holy love he bore thy gracious and divine Majesty. He judged, and rightly, too, that from his stores of science and spiritual riches he could make thee no worthier offering than the representation of thy admirable beauty, so full of charm, which he had contemplated with his very eyes. That holy and learned personage employed all the resources of color and golden mosaic to paint and faithfully limn thy image in his pictures, according to the rules of his art. I, too, in my turn—feeble imitator—desired to follow in the footsteps of that holy man, and devoted myself to religious painting, hoping that my powers would be in no wise inferior to my good will, in order to fulfil my duty to thy sacred person, thy venerable majesty, and thy wonderful magnificence. But I confess that I deceived myself in this bold project, for neither my capacity nor my talents responded to my desires; nevertheless, I did not wish to abandon completely this fine scheme, nor to lose all the fruit of my labor; therefore I have dared to offer and place in thy hands, the explanation and interpretation of that art which I have acquired with the greatest care and most conscientious exactness, in order to form the very best method. For I am not unaware, O Virgin! that thou and the Creator of all things deign to accept everything that man can do; therefore I offer thee this work, which I have devoted to painters gifted by nature, to aid them in the beginnings of their art, and especially to indicate to them a good system. . . . Especially do I desire that thy dazzling and gracious image may be unceasingly reflected in the image of their souls, and may keep them pure to the end of all time; that it may raise the lowly, and encourage those who look upon and imitate that eternal model of beauty. May I, too, by the help of thy blessed virtues, obtain the happiness of beholding thee face to face!"

Then follows an exhortation to the profession, beginning thus:

"TO ALL PAINTERS,

"AND TO THOSE WHO, FOR THE LOVE OF KNOWLEDGE, MAY STUDY THIS BOOK.

"Knowing, O all ye disciples of laborious painters, that the Lord in his holy Gospel cursed him who buried his talent, saying unto him: 'Wicked and slothful servant, thou oughtest to have put my money to the exchange, in order that at my coming I should have received mine own with usury' I myself feared to incur this malediction."

And thus the exhortation concludes:

"I laboriously and carefully collected all this material, assisted by my pupil, Master Cyrillus, of Chio, who revised it most scrupulously. Pray, then, for us, all of you, that the Lord may deliver us from the fear of being condemned as wicked servants.

"The most unworthy of painters, DENYS,
Monk of Fourna d'Agrapha."

"SEVERAL PRELIMINARY EXERCISES AND INSTRUCTIONS

"FOR HIM WHO WISHES TO LEARN THE ART OF PAINTING.

"Whoever wishes to learn the science of painting, should begin by approaching it gradually, and by preparing himself for some time beforehand, drawing simply and without intermission, using no measure till he has acquired some experience and given proof of capacity. Then let him address to Jesus Christ the following prayer and supplication before an image of the Mother of God, the Virgin-conductress, whilst a priest blesses him: 'KING OF HEAVEN,' etc. . . . Then, having traced on his head the sign of the cross, let him say, with a loud voice: 'We pray the Lord—Lord Jesus Christ, our God! Thou who art endowed with a nature divine and limitless, . . . who hast illumined with thy Holy Spirit thy divine Apostle and Evangelist Luke, to the end that he might represent the beauty of thy most pure Mother, . . . thou, Divine Master of all that exists, enlighten and guide the soul, heart and mind of thy servant; so direct his hands that he may worthily and perfectly represent thy image, that of thy most blessed Mother, and those of all the saints; for the glory, joy and adornment of thy most Holy Church. Pardon the sins of those who may venerate these images. . . . Amen!"

"INITIATORY AND CONCLUSION.

"After the prayer, the pupil must learn with exactness the proportions and characters of figures; he must draw much; he must work unremittingly, and, with God's help, he will become skilful at the end of some time, as experience has demonstrated in the case of my own pupils. I have toiled with pleasure over this work, to the end that painters, my brothers in Jesus Christ, and all those who shall adopt this book, may labor for the glory of God. Let them pray to God for me. [Here is a note of warning to malevolent critics.] But if any wicked or envious one, should blame, in any way whatsoever, my disinterested enterprise, let him know that he will only wrong himself; for, as a certain author has said, envy is an evil thing, but, at least, it has one advantage: that it devours the eyes and the heart of its possessor. God knows that I composed this work only to be useful, so far as lay in my power, to whoever intends to consecrate himself to this art, and to give himself up to it with the love of a zealous disciple, and eager, above all things, to possess the precepts of this book. It is to him that I address, in all friendship, the following counsel: Know well, O studious pupil, that if you wish to devote yourself to this science of painting, you must find an able master, who will teach you in a short time, provided he directs you according to our instructions. But if you only meet with a master whose teaching and art are imperfect, try to do as we did, that is, seek some originals by the celebrated Manuel Panselinos.[3] Work from them a long while, exerting yourself till you have mastered the proportions and characters of this painter's figures. . . . It is not only Saint Luke who is blessed, but all those who represent and try to show forth the miracles, the holy portraits of the Lord, of the Mother of God and the other saints; for this art of painting is agreeable to God, and is well-viewed by him. Thus all who work with care and piety receive from heaven grace and benedictions. But let all those who only strive for the love of money, and who are neither painstaking nor pious, reflect well before they die: they should remember with fear the chastisement of him whom they imitate—of Judas, expiating his crime in the torments of hell-fire, from which we hope to be redeemed by the merits of the Mother of God, of Saint Luke the Apostle, and of all the saints. Amen."[4]

It is interesting to compare the Italian Cennino's [1437] exordium with that of Denys. The former is instinct with piety, but of a less slavish kind. There is in it a recognition of personal inspiration, and an artistic freedom unknown to the Byzantine. The quotations that follow are from Mrs. Merrifield's translation.

"Chapter I. Here begins the book on the art, made and composed by Cennino da Colle, in the reverence of God, and of the Virgin Mary, and of St. Eustachius, and of St. Francis, and of St. John the Baptist, and of St. Anthony of Padua, and generally of all the saints of God, and in the reverence of Giotto, of Taddeo and of Agnolo, the master of Cennino, and for the utility, and good, and advantage of those who would obtain perfection in the arts."

"In the beginning the omnipotent God created the heaven and the earth, and, above all, animals and food; he created man and woman after his own image, endowing them with all the virtues. But Adam was tempted, and fell through the envy of Lucifer, who, with malice and subtlety, induced him to sin against the commandment of God (first Eve sinned, and then Adam); . . . Then Adam, knowing the sin he had committed, and being nobly endowed by God as the root and father of us all, discovered, by his wisdom and his necessities, how to live by his own manual exertions. And thus he began

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[1] Continued from page 129, No. 533.

[2] Translated from Paul Durand's French version.

[3] There are no masters equal to those whose reputations have been consecrated by time. Without a knowledge of them no education is complete.

[4] The painter Macarios complained to Didron that the painters of Mt. Athos worked for money, and as quickly as possible; not as of yore, for piety's sake and with reflection.

by digging, and Eve by spinning. Then followed many necessary arts, different each from the other, and each more scientific than the other; for they could not all be equally so. Now, the most worthy is Science; after which comes an art derived from Science, and dependent on the operations of the hand, and this is called Painting, for which we must be endowed with imagination and skill, to discover things (concealed under the shade of nature), and form with the hand, and present to the sight, that which did not before appear to exist. And well does it deserve to be placed in the rank next to Science, and to be crowned by Poetry, and for this reason, that the poet, by the help of science, becomes worthy, and free, and able to compose and bind together or not at pleasure. So to the painter liberty is given to compose a figure, either upright or sitting, or half-man, half-horse, as he pleases, according to his fancy. I have therefore undertaken to adorn this principal science with some jewels, for the benefit of all those persons who feel inclined to learn the various methods, and who worthily and without bashfulness set themselves about it; devoting to the before-mentioned science what little knowledge God has given me, as an unworthy member and servant of the art of painting." . . .

"It is the stimulus of a noble mind which induces persons to study these arts, made pleasing to them by the love of nature. The intellect delights in invention, and it is nature alone, and the impulse of a great mind which attracts them, without the guidance of a master. The delight they take in these studies induces them to seek a master, and they gladly dispose themselves to obey him, being in servitude, that they may carry their art to perfection. There are some who follow the arts from poverty and necessity; but those who pursue them from love of the art and true nobleness of mind are to be commended above all others."[1]

THE PROCESS.

As the difference between the recipes of Denys and those of the modern Athonite painters is but slight and unimportant, and inasmuch as the former are at times somewhat obscure, and would be still more so were they not elucidated by the modern methods, I shall give Didron's account of what he saw on the staging in the Monastery of Esphigménon, supplementing it by a few excerpts from the manual.

"This, then, is the manner in which I saw a fresco painted . . . by Father Joasaph, his brother, a first pupil who was a deacon and prospective inheritor of the atelier, [a second pupil] and by two children from twelve to fifteen years."

"The porch of the church, or narthex, which was being painted at the time of our sojourn, had just been built. It was scaffolded to receive the frescos in the upper part of the vaults. Workmen, under the painter's direction, were preparing in the court-yard the lime for plastering the walls. As it is applied in two coats, there are two kinds of lime; the first, a kind of mortar, rather fine, is mixed with straw, chopped small, which gives it a yellowish color; cotton or flax is mixed with the second, which is less coarse in quality. The first coat is laid with the yellowish lime; it sticks to the wall better than the second. The second is white and fine, and, owing to the cotton, makes a pretty stiff paste; it is this coat that receives the painting."

"The workmen then bring the yellow lime, and lay a coat of it on the wall about one-fifth of an inch thick. Over this coat, several hours afterwards, a pellicle of fine white lime is spread. This second operation requires greater care than the first, and I saw Joasaph's brother, himself a painter, apply this second coat of lime. Three days are allowed for the evaporation of the humidity. If one should paint before the expiration of this time, the lime would soil the colors;[2] if after, the painting would not be solid, and would not penetrate the lime, which would be too hard, too dry to absorb the colors.[3] It is hardly necessary to state that the thermometric state of the atmosphere may curtail or protract the interval that must be allowed for the drying of the lime before beginning to paint."

"Before drawing, the master-painter smoothes the lime with a spatula; then by means of a string he determines the dimensions of his picture. In the field of this figure composition he measures with a compass the size of the different objects he wishes to represent. The compass that Father Joasaph used was merely a reed, bent double, split in the middle and controlled by a bit of wood that joined the legs and opened or shut them at will. One of the legs was pointed, the other was provided with a brush. It would be impossible to fashion a more simple, convenient and economical compass.

"The brush with which one of the legs is furnished is dipped in red; with this color the picture is delicately outlined. The compass is chiefly used for the nimbi, the heads, and the circular parts; the rest is drawn by the hand, provided only with a brush." In a little less than an hour Father Joasaph outlined a life-sized picture, representing Christ in the midst of his apostles, entirely from his head, and without a single alteration, as related in the preceding paper. He began with the figure of Christ. "First he did the head, then the rest of the body, always descending. Afterwards he drew the first apostle to the right, then the first to the left, then the second to the right, then the second to the left, and so on symmetrically for the rest. The painter sketched with his hand raised, so to speak, and without a mahl-stick; this instrument used by our painters, would indent the moist lime. But the hand, when it trembles or is fatigued, is rested on the wall itself."

The outlines of the figures are filled-in with black, relieved here and there with blue, but always in flat tints. This is done by an inferior painter who draws the draperies and ornaments on this ground. The nude parts are reserved for the master.[4] All the draperies are completed, and the nimbus is outlined, before the head, hands and feet are painted. The master then takes up the work and completes the head. He prepares the face with a blackish tint, and strengthens the outline with a still darker color. He paints two figures at a time, going ceaselessly from one to the other: a change that permits the absorption of the washes without loss of time. A preliminary wash modifies the black undertone, and other washes follow quickly, the last having more body. Now the painter takes advantage of the undertone for his shadows; now he puts on his high lights; now he colors the hair; here he reddens the lips, there the cheeks; then he colors the eyes, and so on to the end. The nimbus serves for a color-test. [It is not always easy to follow Didron in his details of the process. Being a layman he is at times obscure, but not in the essentials.] The two heads were finished in a trifle less than an hour. The same painter completed a "Conversion of St. Paul," a fresco 3x4 metres, containing twelve figures and three horses in five days. "This painting was not a *chef d'œuvre* assuredly, but it was better than those that cost our painters of the second class six or eight months' labor. I doubt even if our great painters charged with a religious composition could do more uniformly well; there would be higher qualities, but greater faults in their work than in the fresco of Mt. Athos." Prof. Franchi, of Siena, with all his Italian facility, devoted nearly three hours to a delicately-modelled head in fresco. Wilson says that Michael Angelo allowed an entire day for the heads in the Sistine Chapel, which were very carefully finished. Much less time means much less modelling. Didron does not state how much the Athonite painters modelled their figures; but from his notes and from sundry implications in the manual, I should infer that the colors were not merely laid on in flat tints—which were doubtless used at times with great effect — but that the lights were broadly blended into the shadows, and the features, hair and contours emphasized by a bold and obvious use of the line. Elaborate modelling was suppressed, as the short time required for painting two heads clearly proves.

The gold and silver for the nimbi and costumes are applied when the plaster is thoroughly dry. The picture is then enriched with the finest colors, "particularly with Venetian azure," and the ornaments that decorate the halos, stuffs, etc., are painted. The coarser colors which were used for the figures must be thoroughly dry, so as not to injure the more precious colors, nor the gold and silver. This last paragraph is a paraphrase of Didron's longer one. (For a weekly journal condensation is a necessity). In it the "*secco*" process, so grudgingly used by the Italians is recognizable; only Didron has omitted one important element, the *size*, which is always mixed with the colors for "*secco*" retouches. The "*Manual of Denys*," however, supplies the omission, for it gives explicit directions for the use of azure "*a secco*." "Take bran, wash and rinse it. Then let the water that has served for this purpose stand; afterwards boil it, and when it is cooked, you can mix it with the azure, and paint the grounds. Others maintain that to make a water sufficiently glutinous, the bran must be boiled for a very long time and then filtered. In either case, before using the azure, be sure that the wall is very dry." A special artist whose sole business it is to letter, writes the name of the personage on the field of the nimbus, or around it; and he traces on the scroll held by the figure the consecrated legend recommended by the Manual. When this is done "all is finished." Having summarily described the modern Athonite or Byzantine process of fresco, I shall conclude with a few supplementary extracts from the Manual, which will now be more readily comprehended, and with several observations, deductions and comparisons suggested by Didron's researches.

1. "*How to purify lime.* When you wish to paint on walls, choose good lime; let it be as fat as lard, and see that it contains no uncalcined stones. If it is poor and filled with such stones, make a trough of wood. Dig a pit of the necessary size, put the lime in the trough, and add water which must be stirred with a hoe [*crotchet*] till the lime appears to be thoroughly diluted. Pour this into a basket placed over the pit, which will arrest the stones. Then the milk of lime thus obtained must be let alone till it has coagulated and can be taken up with a shovel." [Further than this the Manual does not state how long the slaked lime should be kept].

2. "*How to mix lime with straw.* Take some of the purified lime and put it in a large trough. Choose fine straw without dust, mix it with the lime, stirring it with a mattock. If the lime is too thick, add water till it can be worked easily. Let it ferment two or three days, and you may then apply it."

3. "*How to mix lime with tow.* Choose the best lime you have prepared, put it in a small trough. Take tow well cleansed from all

[1] It would be interesting for further comparison, did space permit, to quote from the book of the Latin monk Theophilus, written probably in the early part of the eleventh century: "I, Theophilus, an humble priest, servant of the servants of God, unworthy of the name and profession of a monk, etc." He tells us that Greece was the painter of the world in his day, and France the glass-worker. He makes but one slight reference to the fresco: "Its use is rather advantageous upon a new wall for a green color." [*Diversarium Artium Schedula:* translated by Robert Hendrie. London, 1847.]

[2] The materials with which the lime is mixed might soil the colors. There is no reason why the lime should. Didron inexactly uses the same word, *chaux*, both for the lime itself and for the lime mixed with the straw or tow.

[3] In other words, the crust of carbonate of lime would have been formed.

[4] Hence the many inequalities of execution in large works.

bark and well crushed; twist as if to make a rope, and by means of a hatchet, chop it up as fine as you can; shake it well to allow the dirt to fall, and throw it into the trough, where you must mix it carefully with a shovel or mattock. You must take care to try and try again, till the lime does not crack on the wall. Let it ferment as you did the other, and you will thus have lime prepared with tow, to form the superficial coat" [on which the picture is painted].

It will be observed that Father Joasaph and his coadjutors substituted cotton or flax for tow.

4. "*How to plaster walls.* When you wish to paint a church you must begin with the highest and end with the lowest parts. . . . Then take water in a large vase, and throw it with a spoon against the wall to moisten it. . . . If the wall is brick, wet it five or six times, and give it a coat of lime, two fingers and more thick, that it may retain its humidity, and that you may profit by it. If the wall is stone, wet it only once or twice, and lay on much less lime, for the stone readily absorbs moisture, and does not dry. During the winter apply one coat in the evening, and a superficial one the following morning. In the fine season do whatever may be the most convenient, and having applied the last coat, level it well, let it acquire some consistence, then work."

5. *How to paint on walls.* The picture having been outlined, "polish the drapery [the plaster on which it is to be painted], and lay on an undertone. Try to finish very quickly what you have polished, for, should you delay, there would be formed on the surface a crust that would not absorb the colors. Work the face in the same way; draw the outline with a pointed bone, and put on the flesh-color as promptly as possible before the formation of a crust, as we have said before."

6. "*How to prepare the white for wall-painting.*[1] Take some very old lime, try it on your tongue; if it is neither bitter nor astringent, but insipid, like earth, then it is good. It is with this lime, well-selected and well-ground, that the white is prepared. If you cannot find such lime, take old plaster that has been painted, scrape off the colors entirely, and grind it on a marble slab; throw it into a vase full of water, allow it to precipitate, and strain it. You will obtain white by this method. If you cannot find such plaster, you must cook lime, spread, dry, and finally grind it. Always take care to try if it is bitter or astringent; for such must be rejected, as in that case the crust would be formed too quickly, which would greatly impede the work; if it is not bitter you can work without fear."

7. Though the *Manual* recommends a sort of palette, the modern Athonite painters use none. Each color is diluted in a cup or vase, and taken from it when needed with the same brush that has served for the other colors, having first been rinsed in water. The tints are tested on the field of the halos that are subsequently gilded. I have seen Japanese artists work in this way, without a palette; and, like the painters of Mt. Athos, they designed from imagination with great rapidity — and at times upside down — without auxiliary sketches or models.

8. From the foregoing description it will be seen that the Byzantine resembles the old Roman method in one important respect, wherein both differ from the Italian. According to Vitruvius the ancient plaster was laid over a dry rough-cast in six succeeding coats — the first three lime and sand, the last three lime and marble-dust — and well beaten while all were wet. Thus a compact mass was formed that would retain its moisture for several days and permit the painter to work leisurely. The average thickness of this plaster was about 2.7 inches. While the Byzantine plaster was very much thinner — the modern about one-quarter of an inch, the mediæval somewhat thicker — the moisture was retained by mixing straw with the first coat of lime, and, while this was still wet, by applying a second coat of lime and tow (or cotton or flax). Three days elapsed before the painting was begun. Both Roman and Byzantine surfaces were polished, an operation that retarded the setting of the plaster by presenting a greater obstacle to the penetration of the carbonic acid. The Italians allowed the rough-cast to dry thoroughly before the *intonaco* was applied. This was about one-tenth of an inch thick and applied in two coats of lime and sand. Sand accelerates the setting and hurries the painter, who must finish before the crust is formed. But this disadvantage of sand as compared with straw, or tow, is more than offset by its superior binding qualities. The Italians retarded the setting of the plaster as much as they could by washing the lime in water containing carbonic acid, thus ridding it of some of its causticity, but not enough to compromise the final induration of the plaster. They were obliged to work surely and promptly, but not hurridly. The Byzantines could work more leisurely; but from certain observations recorded by Bayet, I should judge that their paintings were less durable. The Roman method *seems* the best from all points of view, but we must content ourselves with this doubt-implying word.

I reluctantly finish this paper without further quoting from the *Manual* — there is so much of interest in it. The poor monk who, for seventy francs copied the manuscript, concludes his work with this prayer: —

"GLORY TO GOD."

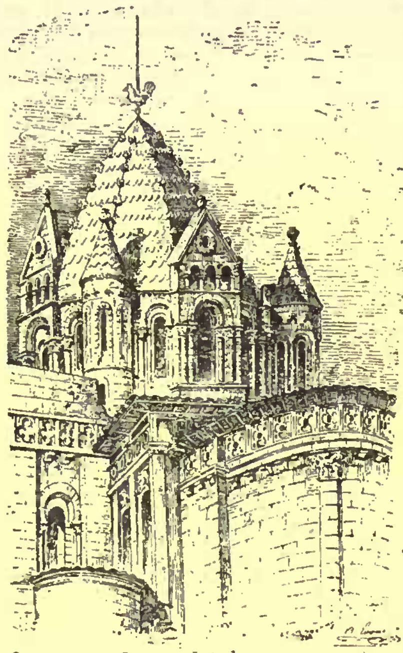
"Having finished, I said: Glory to thee, O Lord! And I said again: Glory to thee, O my Lord! And yet a third time I said: Glory to the God of the whole Universe!"

FREDERIC CROWNINSHIELD.

[To be continued.]

[1] White lead is not suitable for frescos.

ELECTRICAL LEGISLATION IN FRANCE.



The old Cathedral Salamanca. Spain.
(Rep. Cen. Soc. Archts. Paris)

THE extraordinary development in industrial appliances, and their ever-growing introduction to domestic and private life, have led the administrations of various nations to pass into law many edicts, with the object of protecting life, property, and individual rights. Thus the use of steam is bounded by restrictive legislation under certain conditions, in several countries, on account of the inconveniences arising from the smoke of furnaces and the noise of machinery, and from the danger that may result from the explosion of boilers.

The employment of electricity has, till a few years since, been limited to the service of telegraphy, and to a comparatively small number of uses, for which only a feeble current is required. When the application of the electric-light became extended, and dynamos of high potential were introduced into practical use, some accidents, happily of rare occurrence, but striking on account of their novelty and suddenness, led the various electric companies urgently to consider what means should be taken to insure safety. In France the numerous and vexed discussions upon the electrical transmission of power, and especially the experiments at Creil, have caused the question to assume another phase.

Under the administration of M. Cochery, the Department of Posts and Telegraphs assumed the initiative in a project for regulating the installation of electric conductors intended for electrical transmission, either for lighting or other forms of energy. Two decrees, dated the 15th September, 1884, and the 12th May, 1885, established the principle of this legislation, and nominated the commission charged to elaborate it. This commission, as a matter of course, nominated a sub-commission and a reporter, and from the labors of the two groups emerged a legislative project which was recently published in several of the French technical papers, and this document has been very severely criticised in many quarters. The science of electricity is a new one; its most important uses are of very recent date, and they indicate large developments, possibly a revolution in the application of physical forces. For this reason it would seem that the time is badly chosen to hamper, with clumsy and inefficient legislation, the efforts of electricians and the enterprise of their clients, when freedom of action within reasonable limits is especially necessary. Although it may be fairly assumed that our fundamental knowledge of applied electricity is sound and well-defined, we have gone but little beyond in the development of this form of energy in its higher phases. But progress is still rapid, and conditions that appear unpractical or dangerous to-day may be relied upon for their usefulness and safety to-morrow. It should be remembered that only two or three years ago, an electro-motive force of two hundred volts appeared to be the limit of safety, whereas at the present time the Creil experiments, carried out under the control of a commission that includes several State engineers, involve the use of currents of several thousands of volts. Legislation of any kind must therefore be very imperfect, and consequently disastrous to the future of applied electricity. Certainly it would be possible to make such legislation progressive, and to modify it from time to time, according to the development of the science interfered with. There would, however, be but a slender chance of this being done, when it is remembered how tenacious of life in their original form State enactments are, and how often temporary measures become permanent.

It has been asked, and with reason, why the initiative of this scheme, and the control of applied electricity in France, has been entrusted to the Postal and Telegraph Department. The matter has, indeed, formed the subject of much lively discussion. The inspection of steam generators in France falls into the Department of the Ingenieurs des Mines, and, consequently, within the domain of the Ministry of Public Works. Now, as in nearly all cases the source of energy in electrical installations is steam, the latter departmant has urged, reasonably, that one part at least of nearly all electric installation should be under its surveillance. The Postal and Telegraph Department cannot with reason demand a control over the whole domain of electricity, because a special application falls within its province. The utmost it should be able to demand is a proper guaranty against the effects of induction on its own telegraph and telephone wires. But if the control were divided, the private user

would be probably in a worse plight, as he would have to obtain the necessary permits from several departments, and matters would not be improved by the transfer of authority from headquarters to provincial prefects, because those officials, though competent in law, would be incompetent in a practical sense, and they would be obliged to refer applications to headquarters, in order to obtain information on which to act. The misfortune is, that as the Commission has been set going, some result will almost certainly be arrived at. The selection as Minister of Posts and Telegraphs of a deputy from the extreme Left, M. Granet, may possibly afford a chance that the matter will be postponed indefinitely, and resumed some years hence, after our knowledge of the subject has greatly advanced, but it is to be feared that the appointment of M. Granet has come a little too late.

The draft of the measure contains fourteen articles, which it would be useless to reproduce *in extenso*, but the substance of the more important of them will be read with interest. The first article provides that every person who wishes to establish or maintain electric conductors shall apply for the authorization of the Minister of Posts and Telegraphs. Every one acquainted with the habits and customs of a department knows that from this point of departure the prospects look menacing, and realizes months of delay, of unsuccessful efforts, and of weary waiting in the ante-chamber of the minister. It should be mentioned that the draft does not specify, in any way, different types of conductors, overhead or underground, laid on or beneath the public streets, within houses, or in private property. It does not refer to any system of laying, but embraces the subject with the wide expression, "canalization of all kinds." Taking the text literally, no person could establish an electric installation of any sort in his house, whether for bells, telephone or lighting, without official permission.

The third article contains the forms of application, and specifies all points that petitioners must include, nature of steam generator, class of currents, potential at terminals, etc. — a long and exhaustive list. Clauses 4 to 9 relate to the conditions that must be complied with in electrical installations: dynamos placed in dry situations; conductors well exposed to view, thoroughly insulated where within reach; earth returns generally prohibited, etc. In each section of the circuit the diameter of the conductors must be proportioned to the strength of currents, in such a way that at no point any heating destructive to the insulation can take place. On the other hand, nothing is said about the maximum of electro-motive force that will be allowed.

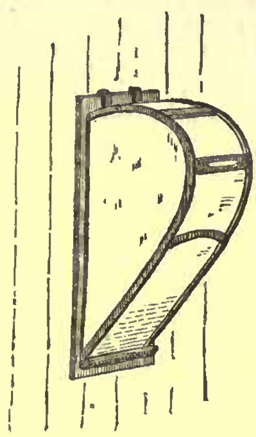
To maintain the execution and maintenance of these conditions, the measure provides for periodical visits of inspection by its agents, and reserves the right of withdrawing the authority already given, accompanied by all the unpleasant results of broken law — legal proceedings, costs, fines, and other consequences.

The programme certainly bears traces of a desire for the public interest and a regard for public safety. But however excellent may be the intentions of the Postal Minister, there is every reason to suppose that the mark he aims at will not be reached, but that, on the contrary, serious inconveniences to the public and delay in electrical progress will result. The Ministerial Commission is composed of eminent persons well versed in administrative questions, but, on the other hand, the industrial element, which would approach the subject in a practical spirit, is scarcely represented. We believe that the Syndical Chamber of Electricity, a body whose proper function it is to consider what can be most usefully done in the way of legislation, is seeking to participate in the counsels of the Commission.

The following curious incident serves to illustrate the foregoing remarks. Some months ago, an engineer, M. Sansoube, entered into negotiations with a little commune of Haute Savoie, la Roche sur Foron, for furnishing it with the electric-light. The work was completed quietly and without any demand for permission, and the circumstances related by M. Paul Giffard, who visited this little installation about a month ago, are interesting. "M. Sansoube," he said, "had the good sense to make no application, neither to the Minister nor to the Director of Telegraphs, although he laid the conductors on the public road. He completed the installation as rapidly as possible. But at the moment when the turbine that furnished the motive power was to be started, the superior telegraph authorities hastened from Chambery and from Grenoble. 'Stop,' they exclaimed; 'you have broken the law; you have acted without authority; an inquiry must be held; an action will be commenced.' But when they arrived at La Roche they found the installation at work, and, after some consideration, the Government officials gave their consent to established facts, certified that the conducting cable would act as a lightning-conductor for the whole town, since in period of flood it would be greatly immersed in the Foron; stated that the same conductor had no effect on the telegraph-wires adjacent; placed the telegraph and postal office of La Roche on the list of subscribers to M. Sansoube's electric-light system, and returned home." This incident is very instructive. It proves that industrials who carry out electric-light installations have greater interest than any one else to have their work perfect, and that to do this they must have a large liberty of action, and freedom from administrative fetters.

We have given so much space to this chapter in the history of electrical industry in France, first on account of its intrinsic interest, and second because although we are not fond in this country of legislative interference with industry, the question may still be an urgent one here, and the experience of France in the matter may prove of value. In England, however, it is probable that the common-sense conclusion will be acted on, that this science, being in its early youth, requires encouragement rather than restrictive measures. Some years hence, when perhaps the great problem of electrical transmission shall have been worked out in complete detail, legislation will be advisable, but in the mean time freedom of action within all reasonable limits is necessary. And of course this opinion is held equally in France, excepting in one or two official bureaus. — *Engineering.*

STEAM-PIPES AND HOT-AIR FLUES.



Japanese Wall-Lantern.[1]

IN the course of a recent lecture by Dr. Tanner before the Louisville Board of Underwriters, the subject of fires caused by steam-pipes and hot-air flues was discussed at considerable length. In the course of his address, Dr. Tanner spoke as follows: —

"Mr. James Braidwood, who was for many years chief of the London Fire Brigade, made the startling statement, in 1846, that it was his belief that, 'by long exposure to heat not exceeding 212°, timber is brought into such a condition that it will fire without the application of light. The time during which this process will go on until it ends in spontaneous combustion is from eight to ten years, so that a fire might be hatching in a man's premises during the whole time of his lease without making any sign.' Among the many instances cited by Mr. Braidwood in support of this statement, is one to the effect that a fire in the Bank of England was traced to a stove which was resting on a cast-iron plate one inch thick, this in turn resting on concrete two-and-a-half inches thick, which was supported by wooden joists, the joists under the stove igniting. If this is a cause of fire, then the majority of houses heated by means of steam, hot-water and hot-air, are in constant danger of fire from spontaneous combustion, since the general impression prevails that the pipes and flues for heating can, with impunity, be placed in contact with timber.

"In examining this cause of fires the first question is, whether wood will char at as low a temperature as 212°. In tearing down houses for the purpose of rebuilding, the timber in contact with the heating-pipes and flues has often been found charred. Charcoal is made for certain purposes in the arts at 300°. As the result of experiments performed by myself in the laboratory, small pieces of white pine, heated a few hours in an air-bath at a temperature of 300°, were partially converted into charcoal. Considering these facts, it must be admitted the temperature of 212° is sufficient, if applied for a long time, to convert wood into a partially-burned charcoal. Accepting this as a fact, the next point to consider is the degree of heat at which charcoal will ignite. Made from the same wood at different temperatures, the products ignite accordingly, that is, if made at a low heat, it fires from a correspondingly low temperature. It has been determined experimentally that charcoal for making powder, when made at 500°, would fire spontaneously at 680°, and when wood has been carbonized at 260°, a temperature of 340° only was required for spontaneous ignition. Under certain circumstances, charcoal made at a temperature of 500° even will ignite when heated to 212°.

"So far the discussion of heating-pipes and flues as a cause of spontaneous fires has been upon the false idea that they are never heated beyond 212°. Under the ordinary pressure of the atmosphere, as when water is heated in the open air, it boils at 212°, but if it is heated under pressure, the boiling temperature increases accordingly; for instance, water boiling at a temperature of 212° is under a pressure of 147 pounds, equal to a column of water one inch square, and about thirty feet high; if the pressure is increased to two atmospheres, the temperature required will increase to 249°, and so on, so that, when a steam-gauge registers sixty, the actual pressure is seventy-five pounds, and the temperature at which the water is boiling as high as 307°. The higher the house, the greater must be the pressure, and hence the higher the temperature at which the water boils, and it follows that the pipes must heat hot accordingly, and it is stated that in some systems of water-heating the pipes have the water started through them at a temperature of 350°.[2]

"Then, where furnaces are used for heating, the temperature in a flue has been found to be 300°, at a distance of fifty feet from the fire. Couple these figures with those given in reference to the heat necessary to produce charcoal and cause its ignition, and it must be admitted that these pipes and flues for heating are responsible for many fires. The application of these facts is as follows: After long exposure, the wood in contact with the heating pipes and flues is changed on the surface to charcoal. During the warm season this charred surface absorbs moisture from the air; then in the fall comes a cold spell and heat is turned on, when the moisture is driven from the pores of the charcoal, leaving it in a

[1] From Prof. Morse's "*Japanese Homes.*"

[2] By the system of low-pressure steam-heating, which is far the most generally used, the pressure is only from five to seven pounds above that of the atmosphere, with a corresponding temperature of 228° to 236° Fahrenheit.

condition to readily absorb gases. The cold abates and the heat is lowered; fresh air in abundance then passes into the confined spaces where the pipes are generally placed, rapid absorption of oxygen from the air by the charcoal follows, with heating and spontaneous firing as already explained.

"The body of the timber is heated, and this heat prevents too rapid cooling of the charred surface when the fresh air passes in, otherwise the charcoal would be placed under circumstances unfavorable to ignition. The experiment of burning iron filings in the flame of a spirit-lamp, illustrates the influence of division upon the igniting-point; now, if the iron is in a pulverulent state, as when made by hydrogen, it will, when freshly made, ignite to a red heat when shaken into the air. Then, if it is true, as stated by an English scientist, that the oxide of iron, if placed in contact with timber and excluded from the air, and, aided by a slightly-increased temperature, will part with its oxygen and be converted into very finely-divided particles of metallic iron, here is another cause of fires from heating-pipes; for, during the summer the pipes rust, and then, when heated, the rust is reduced, leaving the metallic iron in the same condition as that made by hydrogen; the temperature is lowered, fresh air appears, and oxygen is rapidly taken up by the finely-divided iron, each particle heating so rapidly as to give a red heat to the mass.

"I have not been able to prove this experimentally; but as carbon is able to overcome quite strong chemical affinities, and will reduce the oxide under strong heat, theoretically, it is possible, and the authorities all tend to prove it. Considering all the points bearing upon hot-water and steam-pipes, also heating-flues, an explanation is found of the great number of fires occurring at the approach of winter, and which are reported as from defective flues, supposed incendiary origin, or causes unknown. Steam-pipes packed in sawdust or shavings, to retain the heat while steam is conveyed to a distance, have given fires. One peculiar and important instance is on record of a fire from steam-pipes. In the drying-room of a woollen mill a pine-board was placed some three or four inches above the steam-pipes, to prevent wool from falling upon them. A fire followed, and, after being put out, a careful examination determined, to the satisfaction of all, that the heat of the pipes had distilled the pitch from several knots in the pine-board, and this dropping on the pipes had ignited and caused the fire. The illustration needs no comment, as the lesson is too plain to need pointing out."

SOCIETIES

THE EXECUTIVE BOARD OF THE TEMPORARY CIVIL ENGINEERS' COMMITTEE ON NATIONAL PUBLIC WORKS.

CLEVELAND, OHIO, March 6, 1886.

TO THE MEMBERS OF THE CIVIL ENGINEERS' COMMITTEE ON NATIONAL PUBLIC WORKS: —

Dear Sirs,—The Executive Board hereby calls a convention of the temporary Civil Engineers' Committee on National Public Works, to be held in Cleveland, Ohio, March 31, 1886. The purpose of this convention is to close up the work of the temporary organization, with a view to the permanent organization which is to be formed on the following day, or April 1. It is expected that the entire session will continue for not less than three days, or until the character and policy of the permanent organization is fully and satisfactorily defined.

It is very desirable that in the initial or formative stages of a movement of so much moment to the public welfare and to the engineering profession, that every organization of engineers in the country should be represented.

It is likewise desirable that every delegate should be fully informed of the sentiments of the Society which he represents, and familiar with the mature thought of its members.

The Executive Board fully appreciates the fact that the whole question is a matter for the most grave and deliberate consideration. It is fully persuaded by past experience, that a disinterested comparison of views will result in a wise and unanimous conclusion: systems, rather than men, are at fault.

The Executive Board also realizes that the problem involves broad questions of public policy, on which there may be such differences as may take time to determine. It is, therefore, persuaded that the foundations of an organization should be carefully based, with a view to more than temporary existence.

Societies are, therefore, urged to send delegates, as requested by the December convention. Those societies which may not wish to appoint permanent delegates at this time, can send provisional delegates, who will be entitled to all the privileges of the floor except that of voting.

The main topics for consideration at this convention will be: constitution and by-laws — ways and means — action of the convention. The Executive Board must congratulate all interested in the movement on the spontaneous response to the action of the convention of December 5, 1885. It would seem as if the sentiment of those best-informed only needed a nucleus about which to crystallize. Already twenty-two societies, with a membership of some 2,600, have in some manner responded favorably, and it is but a matter of time when all will be included. Until, however, the movement is deeply grounded and thoroughly organized, it is not thought wise to make special effort for general public coöperation, though many public men have already exhibited a gratifying interest.

The Board has felt called upon to act beyond anticipation, and pending the convention will neglect no opportunity to promote the general cause. It hopes that provisional or doubtful questions may so far determine themselves as to make clear a definite policy for the future.

Delegates are expected to send their credentials to the secretary, at the earliest possible date. A programme with full information will be issued at a later date.

The Executive Board, {
L. E. COOLEY, President,
E. L. CORTHELL,
J. B. DAVIS,
JOHN EISENMANN,
AUGUSTUS KURTH.
}

WM. T. BLUNT, Secretary,
44 Euclid Ave., Cleveland, Ohio.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

CATALOGUES WANTED.

AKRON, Ohio.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Since you last heard from us we have passed through a siege of fire. Our office and nearly all its contents, consisting of valuable furniture, drawings, etc., the accumulation of years of study and experience, the value of which we can scarcely estimate, were all consumed in the great fire here, last Saturday morning, of the Schumaker Mills and office. We are again busy at work with what little was left. Will you please put a line in your paper, stating that, with our other effects, we lost all, or nearly all our collection of catalogues, and would be thankful if manufacturers and dealers in our class of goods would mail us copies of their catalogues. Yours truly, WEARY & KRAMER.

VENTILATION OF SCHOOLS.

BOSTON, March 1, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I did not intend to intrude upon your paper again, although when I read your comments of my communication on the above subject I began to think that the study I have made of the subject of heating and ventilation of school-houses had not been very profitable, or else your comments were not in accordance with the facts in the case.

We cannot tell what architects could or *would* do, but only what they *have* done, and I still contend that to Mr. Vinal, City Architect of Boston, belongs the credit of the best ventilated schools in New England, with the exception of Mr. Briggs's school, which I consider to be a fine example of scientific ventilation. You speak of the Worcester High School as an example of a well-ventilated building. The following is what Dr. Lincoln has to say about that school-house:

"*Worcester High School.* — A large and pretentious building of brick and stone on prominent rising ground. The rooms are very high; the doors opening to the rooms are kept open to the very wide halls, and the air is not distinctly bad, though somewhat close. There is a considerable number of flues *not heated*. There is a large room used for drawing by fifty scholars, and once a week by ninety, which has *no ventilation*, and is *probably close*. The hall in the upper story is rather dark, owing to the lowness of the windows. The chemical library is neither well lighted nor *well ventilated*. The cellar is very large and badly lighted; it is too wide for lighting; it is used by the boys for play, and is not a very desirable place. The same want of light is found in the water-closet in the cellar. The room for the boys' clothes, also in the cellar, is very neat and convenient, but has *no ventilation*."

Those who have made a study of scientific ventilation know that a lot of foul-air flues in a building do not of necessity secure ventilation, and to say that considerable attention has been paid to ventilation, often means nothing more than that a lot of tin pipes or flues have been placed in a building to carry off the bad air if it is disposed to go that way.

I do not think any ventilating engineer or practical man would care to provide for more than thirty cubic feet of air per minute per scholar, in the *winter time* at least, as to produce more than that would be a needless waste. In regard to using fans for ventilation purposes, there are fans and fans, and the writer has only to say that those now in use in five of the Boston schools are not likely to be stopped, either on the account of expense or the neglect of the janitor. Regarding the expense of fan ventilation, Prof. Trowbridge, of Columbia College, is authority for the statement that a given amount

of air can be moved cheaper, at all times of the year, by means of a fan than by an aspirating shaft. Experience.

[We are not yet convinced that Mr. Vinal and "Experience" are the only architects in New England who have made "a scientific study of school-house ventilation;" but we leave the matter for those who have done so, if there are any, to come forward and defend themselves against "Experience's" imputations. In regard to the Worcester school-house, it is, however, only fair to Mr. Richardson to say that the drawing-room and chemical laboratory are probably placed in positions not intended for any such purpose, and it is not necessary to infer from Dr. Lincoln's description that the architect did not intend to have some means provided for securing a movement of air through his flues, whatever may be the present method of carrying on the building.—Eds. American Architect.]

Notes and Clippings

The Explorations at Delos. — In the *Revue Critique*, M. Homolle gives an account of the results of the new explorations carried on at Delos. The remains of a mediæval city have been laid bare, and the discoveries in the field of classical archæology, though not so sensational as those of the previous enterprise, are still full of interest for the history of the "island schools." Fifty fragments of marble sculpture have been found, besides terra-cotta and small bronzes. To these have to be added 224 fragments of inscriptions, some dating as early as the fifth century b. c. — none later than the first century b. c. They contain funeral inscriptions, dedications, decrees, and choragic lists. One of them is 600 lines long, and the whole, when edited, are sure to throw much light on the politics and commerce of the Cyclades.

Hydraulic-Lime Concrete. — A kind of concrete, hard and solid, is now being used for building purposes in Paris. It is composed of eight parts of sand, gravel and pebbles; one part of common earth, burnt and powdered; one part powdered cinders, and one and a half parts unslacked hydraulic lime. These materials are thoroughly beaten up together, their mixture giving a concrete which sets almost immediately, and becomes in a few days extremely hard and solid, which property may be still further increased by the addition of a small quantity, say one part, of cement. Among other constructions to which this material has been applied is a house three stories in height, sixty-five by forty-five feet, standing on a terrace, having a perpendicular retaining-wall 200 feet in length and 20 feet high. Every part of this structure was made of the hard concrete, including foundations, vaults of cellars, retaining-walls and all walls, exterior and interior, as well as the cornice-work, mouldings, string-courses, balustrades, parapets, and the building is without band-iron, lintels or wood throughout. — *Exchange.*

Carlyle's Sound-proof Room. — On Saturday a memorial-tablet to Thomas Carlyle was fixed in Cheyne-walk, Chelsea. There is a quaint incongruity and irony about the whole thing that would have pleased, or rather amused Carlyle himself. Carlyle lived in Cheyne-row, Chelsea, at No. 24. The house is well-known. Americans, and even Englishmen, pay pious pilgrimages to look at it. But the premises have got into Chancery, and there they still are. Consequently it is impossible to get adequate permission to fix the tablet, and it is now stuck up, for the present at any rate, on the side-wall of No. 49 in Cheyne-walk. There it will probably remain forever, or at any rate, until all record of a genuine character has become dim, and even the "sound-proof" room is forgotten. This sound-proof room, we believe, still remains. Carlyle had a neighbor who fell into the then modern craze for Cochin-China fowls, and whose favorite cock disturbed Carlyle. Carlyle wrote angrily, demanding that the bird should be forthwith exiled or destroyed. The answer was *non possumus*. Then Carlyle, in anger, built himself a sound-proof room, forgetting that sound-proof rooms are, like safes, absolutely incapable of ventilation. The room completed, he locked himself up in it and smoked; and, being fortunately missed, was discovered by a housemaid senseless upon the floor. Old Chelsea is now rapidly disappearing, and its few relics are proportionately precious. It has been improved out of existence. The noted bun-house, Don Saltero's, and other such places which had memories of their own, are gone. Even old Battersea bridge is now being pulled up by the roots, and Cremorne Gardens (which might well have been preserved with their noble trees as a place of public recreation) have fallen a prey to the speculative builder, and are now the "Cremorne estate" in small flats. — *London Observer.*

Trade Surveys

The wide-spread labor disturbances have at last begun to create apprehensions in the minds of rather conservative directors of industrial interests, that there are real dangers threatening the prosperous trade and industrial conditions. To leap to conclusions at once, the whole matter can be disposed of by stating the fact that with all the talked-of dangers from the cause mentioned a larger and steadily-increasing volume of capital is standing in the market-places of the nation bidding for employment. Capital is not frightened, it is seeking employment with an earnestness never before displayed in the history of the country, not even in the booming times of 1881 and 1882. Investments to-day are legitimate, there is an abundance of money, and there is a spirit of competition between its possessors for opportunities of employment. This in itself is, of course, not conclusive, but it points very strongly to the fact that our industries are not endangered by strikes and commotions. Those who have taken the trouble to recall the downward tendency of prices since 1883, will not be surprised that an attempt should be made by those most interested to restore lost values; this is simply what is in progress. The logic of the case demands that the restoration should be made. The prices of material and of products are steadily declining, and the price of labor is steadily advancing. The volume of money is steadily increasing, and the opportunities for its investment, taking one year with another, are steadily expanding. The elements of weakness in our industrial and commercial systems are being eliminated. The strikes throughout the country will place our industries upon a stronger foundation, strange as the statement may seem. The reason is this, or one of them, at least: Much of our industrial weakness in the past decade or two, has been due to the uncertainty as to the cost of labor, its constant fluctuations, its different price in different localities, and to the bottom fact that employers recognized that it had no value but what it would bring in open competition. Many evils resulted from these conditions. It will be to the advantage of not only laborers but of employers and investors and projectors and all others interested in the employment of labor that these elements be eliminated, that labor be given a relatively fixed value, that these fluctuations therefore be discontinued. One of the results of such a basis would be that skilled labor would be paid according to the degree of its skill; that competition would be robbed of some of its rough edges; that calculations could be made with safety; that more business would be done on a legitimate basis, and that, therefore, manufacturing interests would be both directly and indirectly concerned. These inferences may look to some like theorizing or like far-fetched conclusions, but they have a basis in conditions which must of necessity exist, and always have existed, but have not been recognized. The laborer simply means to have a voice in fixing the value of his labor, and there is more of an advantage in this than is apparent. Without permitting a trade survey to verge towards the grounds of a thesis, it may be said that very erroneous economical theories have obtained recognition in the relations of capital and labor. These agitations are clearing this field and are bringing out into clearer light what these relations should be, and in this respect they are accomplishing good. The industries are in a healthful condition, labor is everywhere well employed, excepting where strikes exist; disputes are being settled by the hundreds. At the recent session of the general executive committee of the Knights of Labor, over three hundred disputes and threatened strikes were disposed of amicably. In a comparatively short time the equalizing process will be completed and harmony will then be developed. During the past six days architects and builders in ten of the leading cities of the country, have announced the projected construction of about 2,500 houses, besides a large number of manufacturing establishments and public buildings. The reports from architects are of a monotonous nature. They continue to be exceptionally busy. Builders are vigorously preparing to crowd through their engagements, anticipating a renewal of mid-summer contracts, of which there are at present many indications. In some manufacturing centres there is a scarcity of brick, but this will be of short duration. Several new yards have been established, and competition will be sufficient to protect builders. Manufacturers of building material are crowding their capacity; so far as reports have been received, an accumulation of stock will be made for emergencies. Some good building authorities feel that the striking spirit and railroad quarrels and other incidents are detracting attention from the real magnitude of building preparations, and that the trade and public will be surprised at the amount of work that will be on hand by mid-summer. As stated above, a great deal of capital is seeking investment, and money-lending facilities are being extended into the West by the incorporation of concerns for the lending of money and for the examination of securities. A company of this character has just been projected in New York. The borrowing requirements of the country are growing and our banking facilities are not quite adapted to these wants; financiers are preparing to establish more convenient machinery for the loaning and protection of money among borrowers. The iron trade has been remarkably quiet for a few days, no symptoms of weakness are observable, crude iron is very firm. In western Pennsylvania a slight advance has taken place. In Lake and Ohio-valley markets a large amount of material is changing hands. Steel-making capacity is being increased and makers of rolling-mill machinery have not been busier for years. Within a few days orders for over 20,000 tons of special grades of steel were placed in Liverpool, and orders for over 100,000 tons of crude iron have been cabled. Importation not only of iron and steel, but of textile products and other manufactured products will of necessity increase because of the high prices of home products. Our latest advices from authoritative sources in all principal lumber markets, indicate that the general tendency of the past few weeks is still working in a straight line towards firmer prices. Every possible preparation is being made by handlers of all kinds of wood, but with all the immense supply assured, the spirit of competition will be less active, and better prices realized, for the more carefully prepared stocks. The supplies of yellow-pine, cypress, Southern walnut, and some other Southern woods, will be very largely increased in this and other North Atlantic markets. The rates of money in the West on good security are five to six per cent; as soon as more ample lending facilities are established the rate of interest must decline. This rate is reasonable, but there is much capital that would willingly take less. Opportunities for railroad investment will not absorb all the available capital, but will, year by year, leave a larger surplus for general investment. This tendency has been observable for three or four years. Railroad managers are building more of their additional mileage out of their own earnings than heretofore, and each year will develop a greater ability on the part of railroad companies to prosecute their enterprises independently of money-lenders, large or small. There is a wonderful activity in the smaller towns and villages, not only throughout the New England States, but through the far Western States; very little of this information finds its way into public prints because of the lack of established channels. Towns of from 2,000 to 5,000 inhabitants are stimulated with a spirit of activity. The basis of this activity is manufacturing. The extent of this enterprise will be determined largely by the opportunities afforded by money-lenders. Capital, with its extremely conservative instincts, hangs closely to financial centres, accepting a mere pittance for its assistance. There are influences at work, as above indicated, to draw it out into reproductive channels throughout the great West and South, irrigating those sections, so to speak, and making them more valuable and more highly productive. A host of little industries have been springing up during the past year or two, all of which could profitably use assistance, and the lending of money to them will help to increase the industrial activity and expand building operations. The evidences of our industrial expansion are multiplying on every hand; the small towns and villages are doing their best, extending invitations to capital and enterprise. Our large cities are not behind; our railroad builders are just as energetic and enterprising. New territory is being opened up, and little industries are springing up to create traffic. The machine-shops of the New England and Middle States are loaded down with orders, and perhaps as much as twenty-five per cent of the capacity is working "over time" to complete orders for work calling for delivery in April. A great deal of business which has been held back for a month or two, has been coming forward during the past week or two, and, in spite of all the labor agitations, and advancing prices, there is an activity and a confidence among the leaders of the industries which points to a continuous improvement.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 535.

MARCH 27, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

ONE of those admirable reports, issued on occasion by the Boston Manufacturers' Mutual Fire Insurance Company, has just been published, containing an account of some new tests of automatic sprinklers of various sorts, made on behalf of the Mill Insurance Companies by Mr. C. J. H. Woodbury. Architects and builders are not so much interested as mill-owners in the details of the tests of each particular kind of sprinkler, but the statistics of the service performed by sprinklers in general in protecting property from fire, which Mr. Woodbury gives, are very instructive. It is about ten years since the first automatic sprinklers were introduced into factory buildings, and mainly, we imagine, through the earnest advocacy of the mutual insurance officials, they soon came into general use in such structures. For other buildings, such, for instance, as theatres, they were at first regarded as unsuitable, perhaps on account of the danger of freezing, but this prejudice is now nearly abandoned, and all the new first-class theatres in this country, we believe without exception, are equipped with a full sprinkler service over the stage. There may, however, be still some persons who regard their use as an experiment, and to such persons the statistics given by Mr. Woodbury will appear particularly important. For mills, at least, there is no longer anything of experiment in the sprinkler service. Since 1876, when the apparatus was first introduced, there have been two hundred and twenty-four fires in factories furnished with them, and insured in the New England companies, while six hundred and thirty-one fires have occurred during the same period in mills without their protection. No one will claim that the number of examples of each sort is not sufficiently large to afford a satisfactory test of the comparative value of the two systems, but it is rather startling to find that the total loss by all fires for nine years in the mills furnished with automatic sprinklers was less than eighty-six thousand dollars, an average of three hundred and eighty-two dollars for each fire, while the losses in the mills without sprinklers during the same period amounted to four million six hundred and forty-five thousand dollars, an average of seven thousand three hundred and sixty-one dollars for each fire. This is more than nineteen times the average loss in the sprinklered buildings, so that it is fair to infer that if all the mills had been required to put in sprinklers at the time of their first introduction, the companies would have saved four million four hundred thousand dollars in nine years. Dividing this by the number of unprotected mills in which fires occurred, we have a quotient of seven thousand dollars, and as it would not probably have cost more than two thousand dollars apiece, on an average, to put sprinklers in these mills, it follows that the mutual companies might have furnished these mills with sprinklers at their own expense, and would even then have made a profit on the transaction of three million dollars in nine years, with a prospect of future profits at a considerably larger rate for an indefinite period. In the present case, the mill-owners being their own insurers, the result would practically have been that they would have taken a dollar out of one pocket and put four dollars into the other, but the story has a moral for the managers of stock as well as mutual companies. As the account shows, however, some of the sprinklers used in the mills nominally so protected were inefficient, so that heavy losses occurred in spite of their feeble efforts, and we should, perhaps, make our comparison between the unprotected mills and those furnished with the Grinnell sprinklers, which have shown themselves, in one hundred and two fires, to be, perhaps, the most effective of all. In these one hundred and two fires, all of which have occurred since 1881, the average loss has been one hundred and twelve dollars and seventy-six cents, or much less than one-third the average loss with all sorts of sprinklers, and about one sixty-sixth the average loss by fires in mills without any sprinklers. To repeat, therefore, our comments in another way, supposing the number of mills insured in the factory mutual companies to be two thousand, if the companies had, at their own expense, put in Grinnell sprinklers in all of them in 1876, at a cost of four million dollars, they would already have got all their money back, with six hundred and thirty-five thousand dollars additional as interest, and would be in the steady receipt of about five hundred and twenty-five thousand dollars a year as income from their investment.

MR. MICHAEL DAVITT, the well-known defender of the rights of his country in the British Parliament, has published a series of papers in the Dublin *Evening Telegraph*, upon the condition of the habitations of the poor in that city. Some of the facts presented in his papers, as quoted in the *Sanitary Record*, are of interest and importance, but calm and dispassionate statement is not Mr. Davitt's strong point, and it would be amusing to observe the eagerness with which he seizes upon the smallest pretext for assaulting the landlords, whom he has evidently intended to attack under cover of a benevolent purpose, were it not that his thrusts at his political opponents, many of whom are no more responsible than himself for the condition of their poor tenants, turn away attention from the real problem of the amelioration of the habits and tastes, no less than the surroundings, of the very poor. As usual with the sentimental, as opposed to the efficient philanthropist, Mr. Davitt begins his report of the result of his inquiries with a peroration about "grinding exactions," to which, as he says, the rack-renting of the impoverished western cottiers can scarcely be compared, concluding his stream of preliminary eloquence by asking whether it is "possible to restrain a feeling of the deepest indignation at the existence of any system by and through which the respectable classes of society, whose laws punish with severe imprisonment any petty theft committed by common criminals, can take away one-sixth of the yearly earnings of the poor for the privilege of house shelter?" What imprisonment for theft has to do with house-rent we cannot see, but the idea that the payment of one-sixth of one's income for house-rent is a thing to be viewed with the "deepest indignation" must strike Americans, who habitually pay one-fourth or even one-third of their incomes for rent, as ludicrous. What sort of house Mr. Davitt may have been accustomed to, or what his income may be, we cannot say, but we can assure him that in this country, and, as we believe, in his own, the better men of all classes can and do pay such rents as these without thinking of calling their landlords, as Mr. Davitt does, "unconscionable Shylocks," and contrive to live happily and honestly on what income they have left; and when, by industry and economy, they have saved up enough money to build houses to let in their turn to their younger compatriots, they find the exaction of such rents as they themselves paid necessary for securing a return from their investment equivalent to what the money would bring if they had deposited it in a savings bank or bought railroad stocks with it.

IF one pursues such investigations by means of inquiry among idle and shiftless tenants, he is pretty sure to learn that the filthy surroundings of his informants are due to the "oppression" of their landlord, and one of Mr. Davitt's own most harrowing stories tells us about a poor widow, earning a dollar and a half a week, who hired a single room, at fifty cents a week, and harbored therein not only her nephew, who was "subject to occasional attacks of rheumatism," and therefore did no work, but slept on the floor much of the time, but also

a male lodger, who paid fifty cents a week for his share of the accommodation. A more striking example of immoral over-crowding and exorbitant rent it would be hard to find, but it seems rather harsh in Mr. Davitt to accuse the owner of the house of "living on the vitals of the poor" in this instance, where it was evidently the widow who lived on the vitals of her lodger, by charging him as much for one-third of the room as she paid for the whole of it, while her lazy nephew completed the circle by living on hers.

THE remedy which Mr. Davitt proposes for these evils will seem as inconsiderate and sensational as his method of investigation. In brief, he thinks that the tax-payers ought to pay poor people's rent for them, the distribution of the rent-money to be made by the town council. Fortunately, there is no danger of the adoption of such measures by any civilized community. To say nothing of the prudence of entrusting the payment of poor men's rents out of the public funds to such a city government as that of New York, for example, the effect upon the honest poor would be ruinous. As no one would throw away money in building tenements, which he must lease in competition with the free lodgings provided by the municipality, the supply and the quality of habitations for the poor would decline together, while filth and vice would riot in the facilities provided for them in the name of charity. The *Sanitary Record*, which knows far more about the subject than any political agitator is ever likely to do, says, what all experience shows to be true, that if a thousand of the occupants of squalid and crowded tenements whom Mr. Davitt pities so were to be transferred to-morrow into improved and wholesome dwellings, a month would not pass before half of them had returned of their own accord to their old homes, while at least half the remainder would have contrived to make their new abodes as filthy and unwholesome as the old ones.

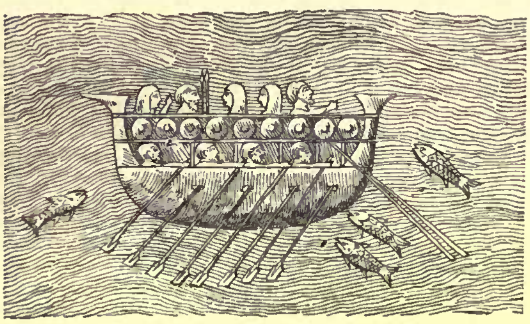
MANY of our readers have probably been in the ancient Salle Valentino, in the Rue St. Honoré in Paris, once, we believe, used for the presentation of Italian opera, but devoted more recently to military panoramas of the sort now so fashionable. Within a few months this famous old hall has undergone the most singular transformation which it has yet been called upon to endure, and has become the Nouveau Cirque, the most remarkable novelty about it consisting in the fact that the central portion is occupied either with land or water, as may best suit the occasion, and the performances in it may be either equestrian or nautical at pleasure. In practice, exercises of both sorts are given during the same evening, and after an hour has been devoted to bareback-riding, monkey-races and the other delights of the ordinary circus, a bell rings, the covering of the arena, which consists of an immense rope-mat instead of the usual layer of saw-dust, is rolled away, and the floor is seen to sink slowly beneath the waves of a lake, in the waters of which naiads are seen disporting, while boats issue from their shelter and perform interesting evolutions on the surface. As might be imagined, this spectacle always calls forth thunders of applause from the audience, and the ingenuity of the idea, as well as of the machinery by which it is carried into successful execution, certainly deserves the highest praise.

ACCORDING to *L[illegible] Civil*, which gives a long account of it, the apparatu[illegible]ing land into water is simple enough in principle, although many practical difficulties must have been overcome in arranging the details. To describe it in a few words, the circular arena is constructed with water-tight walls, and is supplied by four powerful pumps from a well sunk beneath the building. Within the space is also arranged a flooring of stout wooden lattice-work, covering the whole area, and carried by a frame of iron girders, which rest upon the piston of an enormous hydraulic press. On allowing the water to flow out of the press, the piston sinks, and with it the floor, which, being very heavy, and filled with small openings, passes readily downward through the water until it reaches a sufficient depth to allow of swimming and diving in the water above it. When it is needed for the sports of dry land, the floor is raised by forcing water into the hydraulic press until it reaches the surface of the little lake. As this is eighty feet in diameter, and the floor is balanced on the supporting piston in the middle, it would be hazardous to allow horse-races to take place over it without providing it, when raised to its normal position, with supplementary supports, which are provided by a very clever device. Besides the central piston, the floor has, attached beneath its outer edge, twenty cast-iron columns. These columns, however, instead of helping to raise the floor, hang from it, moving up and down in vertical cylinders sunk below the bottom of the lake. The columns are of such a length that when the floor which carries them is raised to its proper height, they are extricated from their sockets, and hang just above the level of the bottom of the lake. At this point a slight movement of rotation is given to the frame, the columns are carried laterally until they hang suspended just over a solid support, and the piston is then lowered enough to bring the whole down to a firm bearing. Nothing is then necessary but to spread the rope mat over the surface, and everything is ready for the horses. A reversal of the process reconverts the scene again into a lake. In winter the water of the basin is warmed by the exhaust steam from the boilers, and in summer it is intended to remove the lower rows of seats, and use the whole parterre in connection with the arena as a swimming-bath.

THE *Deutsche Bauzeitung* tells an interesting piece of news about two of the best and most distinguished architects of Berlin, Messrs. Ende and Böckmann, whose beautiful design for the German Parliament-House will be remembered by many of our readers who know nothing else of their work. It seems that the Government of Japan, together with the other sciences of civilization, has determined to introduce into that country the European methods of building, and has decided to set the example by commencing at once the construction in Tokio of public buildings on a great scale. The most important of these buildings is to be a Parliament-House, and a Palace of Justice is to be erected at the same time. When these are done, other structures are to follow. The Japanese ministers, with their usual sagacity, after studying the whole field of civilized architecture, decided that they could best get such service as they required by employing a German architect of the highest class, and their choice fell upon Messrs. Ende and Böckmann, with whom their messengers recently made a contract for professional services, in connection with the first two of the new buildings. As nearly every sort of material and process employed in European building is unknown in Japan, the first step toward the work consists necessarily in an examination of the quarries and timber-lands of the Empire, with a study of the native modes of using stone and wood, and Herr Böckmann is already on his way to Japan for this preliminary inspection. With him goes another architect, Herr Manz, who is to stay permanently in Japan, while Herr Böckmann, after a four months' tour through the country, will return to his Berlin office, to prepare the sketches for the two great buildings.

AMERICAN civil engineers should take a certain satisfaction in learning that such highly-trained men as the French engineers of the Ponts et Chaussées have been led, within the past few years, to make a considerable change in their methods of building bridges, as a result of the information brought to them by M. Malézieux, who was sent to this country not long ago to study our suspension-bridges, and returned with some new ideas, which have proved very attractive to his brother engineers. It is unnecessary to say that, for a long time, any mode of bridging a chasm has been preferred in Europe to that which involves the use of ropes. According to the *Revue Industrielle*, this prejudice against suspension-bridges dates back to the time of an accident which happened to one at Angers, but, whatever its origin, it has been very general in the profession. M. Malézieux, before his trip to the United States, shared this prejudice with his fellows, but the methods in use here for anchoring the cables, and for permitting faulty ropes to be replaced at pleasure without throwing an undue strain upon the others, which he had never heard of before, appeared to him so ingenious and effective that he returned to France with his opinions about suspension-bridges greatly modified. The publication of an account of his observations served to communicate his modified sentiment in this respect to other engineers, and the result was soon seen in the construction, with the approval of the Government inspectors, of several suspension-bridges in the mountainous parts of France. Many American improvements have been introduced in these, and the result is said to be so satisfactory that bridges of a similar sort are likely to become common.

ART IN PHŒNICIA AND CYPRUS.[1] — II.



Phœnician Merchant Galley, from Layard.

AS in Egypt, as in Mesopotamia, so here again in Phœnicia, we find physical conditions potently modifying the political and social characteristics of the nation. Owing, indeed, to the peculiar formation of its territory, the Phœnician race hardly deserved to be called a nation at all. The mountains came down almost everywhere to meet the sea; the towns lay in what were little more than crevices of the rock, or stood on tiny islands near the shore. Each was cut off from its neighbors, and the water formed an easier and safer way of communication between them than the difficult roads which climbed and descended the steeps — then clothed with a dense growth of timber, though now so bare that it is hard to think of the ancient race as easily building their multitudinous wooden ships. Of necessity it was a ship-building race; and equally of necessity it was not a nation, but an aggregate of isolated towns, which were loosely bound together by community of origin, and language, and habits, and religion, but were never united under a common head, never acknowledged a national capital, and were always quarreling with each other for that authority which was far more valued for the commercial than for the political leadership it gave. Moreover, the conformation of the country forced the Phœnicians to be not only mariners, but colonists. Those distant settlements which commercial reasons made so desirable, physical reasons made indispensable — Phœnicia proper could not long absorb its growing population. And, once more, it was its peculiar conformation which made the Phœnician land the first wherein municipal liberty was developed, and, as a consequence of this, the dignity of the individual citizen. A municipal form of government was the only possible form. It seems to have been oligarchical in character — sometimes more and sometimes less pronouncedly aristocratic, and often with nominal kings at the head, but, of necessity, never wholly undemocratic. It was geographical facts which permitted, nay, prescribed, that in Phœnicia, as in Greece, the individual city, and with it the individual citizen, should assume a station they never had or could have assumed in those wide, homogeneous countries, where a far-reaching despotism had an easier task. We know and acknowledge the world's debt to Greece in this matter. We should be doubly ready to acknowledge it when Phœnicia is in question, for Phœnicia, and not Greece, was the innovator, the originator.



Eglise de la Dalbade, Toulouse, France. — The Doorway.

Although not the most ancient of Phœnician towns, Gebal seems to have been the first to achieve any conspicuous station above its fellows. But already, in very early days, Sidon stood preëminent, with Arvad to rival it in the north and Tyre in the south. Sidon lay on a little promontory facing southward, its harbor formed by a line of rocks. Arvad occupied an island at some distance from the shore, and Tyre, as every one knows, was built on a number of small islets, artificially connected, which altogether offered so small an area that, though closely built with very lofty houses, it could scarcely have accommodated more than twenty-five thousand souls. Not only was its insular character destroyed by Alexander's famous mole, but this so interfered with the natural action of the sea that its harbors quickly silted up — what was once the "Egyptian harbor" is now lost even to the archæologist's careful search, while the "Sidonian harbor" can shelter but a few little boats. In Macedonian times there seem to have been three distinctly-marked Phœnician communities; one with its centre at Arvad, one gathering around Gebal (or Byblos), and the third (and by far the most important) containing Tyre and Sidon and their dependencies.

The nominal vassalage to Egypt which was forced upon the Phœnicians when the Pharaohs overran all Syria, proved a benefit, and not a misfortune. The commerce of the Delta was thrown open to them; and, with the prestige of Egypt at their back, the Sidonians began to sail into the unknown northern seas, and carry trade and civilization in their hands. On the south shore of Asia Minor; in Cyprus and Crete, and many an island of the archipelago; in Beotia and Laconia they were soon established; and an especially strong colony was set up in the island of Cythera, off the south coast of Peloponcus, where were factories for the production of those wares which thence could find an easy market. The Euxine, too, was visited by them, and, ere long, they pushed farther westward, took possession of Malta and Gozo, colonized Sicily and the south of Italy, and founded Utica and that town of Kambe which later the whole world knew as Carthage.

About 1,000 or 900 years B.C., Sidon was sacked by the Philistines and Tyre rose to the higher station; but the same work went on. All along the fertile north shore of Africa Phœnician colonies were planted, and Kambe was re-inforced and christened Carthage, or the "new city." Although this far western child soon grew into a powerful rival, her debt of maternity was constantly acknowledged, and a singular degree of friendship (for Phœnicians) subsisted for centuries between the two towns. And for at least two hundred years Tyre was still preëminent above all places owning the Phœnician name, for riches, and commercial activity, and power. Sardinia and Spain were colonized by her, and with its Spanish trade began the most splendid epoch of Phœnician commerce. "The ships of Tarshish" brought — far more cheaply than could be done overland from the east — those metals which were to play so large a part in the artistic influence of Phœnicia; chief among them *tin*, a humble-seeming metal in itself, but necessary to the making of that which, from an artistic point of view, is the noblest of all metals — bronze.

As the Phœnician race prospered at home, so it prospered in Africa; and even when it began to decline at home Carthage went on growing and colonizing and extending its trade and its influences together. Far more indeed than the energy and power of the mother-country was inherited by Carthage. She first developed the love of conquest as well as of mere colonization; she first had standing armies and fleets of war; she, first of the Phœnician name, established herself as a political rival to the great political powers that were.

Perhaps it may seem as though too many words have been given to the non-artistic activity of the Phœnicians. But it is only through an understanding of this that we can understand their artistic activity. And, moreover, it is only by following them in every colonizing effort, it is only by tracing their steps North and West and South, even unto the Pillars of Hercules and beyond, that we can get any knowledge of the legacy they have left the world. Not at home, not in Phœnicia proper, but far abroad (in what as a parallel to Magna Græcia we may call Phœnicia Magna) must we look for our treasures of Phœnician industry and art. And this Greater Phœnicia is no one spot of land, but a score of lands and a hundred spots scattered all along the vast Mediterranean basin.

[1] *History of Art in Phœnicia and its Dependencies.* From the French of George Perrot and Charles Chipiez. Translated and edited by Walter Armstrong. In two volumes, illustrated. London, Chapman & Hall, Limited. New York, A. C. Armstrong & Son. 1885. Continued from No. 531, page 138.

A word must be given to the Phœnician religion, although our knowledge of it is but scanty. Fetichism shows in its earliest days as in those of all religions. But by the time the foreign commerce of the country was well established, its cult was certainly in its fundamental ideas (though certainly not in the rites by means of which they were expressed) in advance of that of the Egyptians. "There were no sacred animals and men were less pre-occupied with the worship of the dead. Their adoration was chiefly addressed to the stars and to those great phenomena of nature which seemed to them to be the results of deliberate action on the part of some powerful and mysterious god. Their polytheism was more abstract, more advanced even than that of the Chaldæans; it was further removed from that phase to which we give the name of polydemonism; their pantheon was less numerous and its members were more concrete. Already, perhaps, the idea of a single supreme being was beginning to disengage itself from the conception of a crowd of distinct divinities, and the latter to sink into the condition of mere embodiments of the different modes and phases of a god in whom they were all summed up." All of which hints at the kinship between Hebrew and Phœnician. But the analogy goes no farther. On the one hand religion mattered comparatively little to the great practical, material, commercial nation — mattered much less than it did to the speculating, theorizing, intellectual Greek, not to speak of the spiritual, moralizing Jew. And, on the other hand, the Phœnician rites of worship stood at the opposite extreme from the Hebrew — were the most gross and brutal known to the classic world. Unspeakably licentious, they were inconceivably inhuman too. We know how the Hebrew judged of them; and imagine even an Egyptian or a Chaldæan or a Greek or Roman taking part in those human holocausts which to so late a day persisted in the Phœnician temples!

Our authors trace in a most instructive and interesting manner the way in which this people took up and transmuted the religious ideas and customs of other nations during their long and varied intercourse, and the way in which their own gods and their own ideas were adopted or unconsciously imitated by the Greeks. But here it must suffice us to note the effect their religious attitudes in general had upon them in their great rôle as transmittors of artistic influence.

Their comparative indifference and their comparative tendency towards monotheism alike had a potent result in the way of hindering the development of a native school of art. There was no such demand with them as there was with the Greek and the Egyptian for noble works of sacred architecture, or as there was with the latter for splendid and colossal tombs; nor again, was there any such impulse towards the portrayal by the sculptor of human forms as worked in Egypt, or towards that realization of a multitude of divinities which was the great motive power in Greece. Of course, we should speak of reaction here as well as of action. Of course, had the plastic instinct been strong in the race its religious attitude would have been different, or, at least, would differently have been expressed. But it is only the connected facts we need to note just here, and not their exact relationship as effect and cause.

On the other hand, there was one immense advantage to the later world in the Phœnician's religious attitude. If it hindered him from being a creator, it helped him to help the creative Greek in a peculiarly happy way — helped him to transmit only the noblest impulses and the purest types. "Pupils, as they are, of Egypt, the Phœnicians never borrowed those composite deities of hers with the heads of hawks, ibises, cats, crocodiles and hippopotamuses; they only adopted such divine types as were taken from humanity. . . . Whenever the Phœnicians had to provide a head or a complete body for any one of their gods they were as frankly anthropomorphic as the Greeks themselves. The consequences . . . may be guessed. When they began to provide the still barbarous Greeks with those models which the latter at once hastened to imitate, they did not put into their hands any of those strange and graceless combinations of human and animal forms of which the dwellers in the Nile valley were so fond. In the idols they exported no features but those of men and women were to be found; their execution was awkward and rough, but it had at least the advantage of pointing to the right way, to the only path by which a great art could be reached." Even the grossness of Syrian art, add our authors, had its uses too. It "awoke in them the desire to make a close and patient study of the human frame, the most delicate and complex of organic bodies. Thus were they led to understand the difference between the two plans on which Nature has built every living thing — a difference which shrinks almost to effacement in those animals with which the religious iconography of Egypt was content. . . . So that in the statuettes of stone or clay, which the Phœnician merchants scattered broadcast over the whole Mediterranean basin, we must recognize the elder sisters, or rather the grandparents, of those marvellous gods, of those noble and smiling goddesses before whom the Greeks bent in worship, and before whose fragments we moderns bow in worship too."

And now a word in passing as to the Phœnician form of writing. There is nothing to represent the pictorial or semi-pictorial or once-pictorial writing of Egypt and Mesopotamia in even our earliest Phœnician relics. "The Phœnicians learned to write when they invented the alphabet. No one believes that they created it, all-standing, but it is still doubtful whether they took their materials from the wedges of Mesopotamia, or from the writing of Egypt"; or, if from the latter, whether from its hieroglyphic or its cursive form. "The oldest-known alphabetical inscription is that of Mesa, king of Moab, which dates from the year 896 B.C., and it already contains evidence of great fluency and of very long habit in the use of a written character. . . . In such matters we can hardly suggest a date, but it seems very probable that the Phœnicians were already in possession of their alphabet when they first began to navigate the Levant. In any case, the invention was known to the first Sidonian sailors who landed on the coasts of Greece and her islands."

A great invention it was, in truth — this power of representing sounds by signs which stand for the elementary articulations of the human voice, and not for things, or ideas, or even syllables; very much more important to the world, as our authors tell us, than that invention of printing which is held typical of revolutionary force. "The hands of unknown great men," says an ancient proverb, "have made it a world for us." What honors should we not pay him, did we know of that great Phœnician who first thought of the way in which the world of letters was made possible to all nations and for all times! He did not make a literary use of his invention himself, neither he nor any of his fellows. He invented, and they developed and practised only and solely with practical ends in view, and only and solely for the recording of practical facts, chiefly, of course, of those which had reference to trade. Yet every phonetic alphabet that has since existed is the lineal descendant of his; and every great thought that has been preserved in any, has him as its foster-father.

Even for the nobler epigraphic purposes the Phœnician rarely used his great new instrument. "We may at least affirm that the public monuments of Phœnicia were without inscriptions down to the Greek period. . . . In the whole vast repertory which we owe to the industry of M. Renan and his colleagues, we cannot cite a single text that may fairly be compared to those inscriptions of Greece and Rome, in which the voice of a great and free people makes itself heard across the ages. . . . And in Phœnicia the form is worthy of the matter. Phœnicia had no special form of letters for monumental use. Her epigraphic alphabet never lost its cursive look. In Phœnician inscriptions we find none of those expedients with which the Greeks and Latins contrived to give an architectural character to their texts on stone. . . . It certainly never dawned upon the mind of a Phœnician that an inscription might have its beauty even for those who could not read its words." Truly we may see from small things, as well as great, whether a nation be artistic or no. Truly typical of its attitude in everything is the fact that in its writing "the Phœnician genius thought only of the immediate practical result; was essentially utilitarian."

Phœnician art, as I have said, must be studied under peculiar and very difficult conditions. The traces it has left in the mother-country are very feeble. Nowhere, in fact, are its remains so uncommon as in Syria. M. Renan ("*Mission de Phœnicie*") explains the fact by tracing the history of the land, noting how it has always been very thickly peopled and by constantly changing peoples. Greek, Roman, Byzantine, Crusader and Mussulman successively conquered and destroyed and re-erected — and their re-erection meant destruction, too, for it meant the using over and over of the old stones and the cutting-up of their huge bodies into smaller units. The better the workmen, the worse the results to the eye which looks for a trace of the original artist. "The Templars, the Hospitalers, the whole of the great feudal bodies of Syria built gigantic walls for their own defence; and as they were good builders and seldom used a stone without having it first re-worked, the evidences of the early civilization were widely obliterated. Hence the archæological destitution of the coasts of Syria and Cyprus."

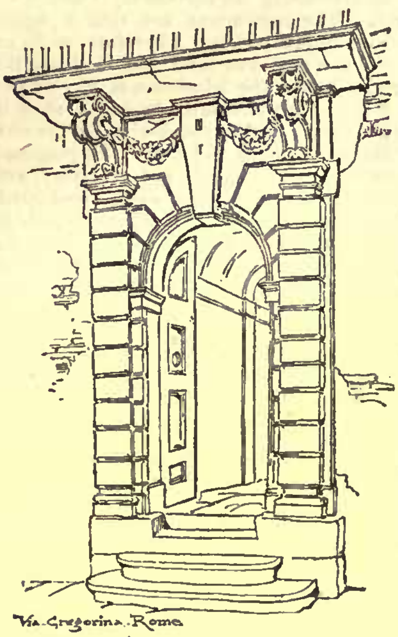
Then we should take into account that seaboard situation which so facilitates not only the destruction of architectural, but the removal of portable relics; also the religious reactions which, being here experienced by a people less artistic than were the Greeks even at the time of their Christianizing, were peculiarly fatal to the tangible remains of paganism; and also political anarchy and the consequent lack of restraint upon the greed of the degenerative natives. And when we "reckon up all these conditions and add to them the zeal of those modern searchers for antique wealth who overrun the whole country, we are surprised that a single vestige of the past remains in it."

M. G. van Rensselaer.

[To be continued.]

The Movement of the Washington Monument. — At a recent meeting of the Washington Monument Society, Colonel Casey made some very interesting statements to the members in regard to his observation of the habits of the monument, for it appears that the great obelisk is a moving, if not a living thing, and that it has a regular swaying motion when the sun is shining upon it. On every bright day the apex of the monument moves at least one inch westward in the morning, when the sun's rays first fall upon it, and eastward again in the afternoon, when the sun reaches the western side. The heat of the sun's rays have an expansive effect upon the masonry, and the plummet that is suspended in the interior of the monument registers this movement from day to day. — *Boston Transcript.*

THE REPORT OF THE MASSACHUSETTS DRAINAGE COMMISSION.[1]—II.



Italian Doorway from sketch by the late Sir Digby Wyatt. Lond.

CONCERNING the relative advantages of broad irrigation and intermittent filtration, the case is, in the main, well stated. Doubtless the former would be used with the latter as a means of relief or as a means of agricultural advantage, much more generally than the commission has assumed. This would be regulated by experience.

The requirement that, so far as possible, irrigation-areas shall be removed beyond the limit of the Boston water-shed, seems fanciful, when we consider the manner in which the streams of that water-supply receive their chief contributions. The amount of water flowing to them over the surface of the ground is insignificant, when compared with that which comes to them from what Mr. Clarke aptly describes as a "wet sponge" — the saturated subsoil of the district. Rainwater and other surface-water, however impure it may be, is purified before it penetrates far into the earth. Whether it be the slops thrown over the back-yards of a town, or that which soaks into the surface of the street, it does not descend far before it is essentially purified. The same would be true of sewage intermittently delivered onto ground prepared for its purification.

The same is *not* true with reference to the foul water entering the soil at lower depths. Every cesspool, every privy-vault, every leaking house-drain, every leaking town-sewer, delivers its foul flow into ground that is powerless to purify it except by dilution. The stream flowing through a porous subsoil toward the river by which it is carried away, cannot pass under a small cesspool-village without receiving enormously more filth, and filth of an enormously more dangerous character than could possibly be derived from any such system of filtration as a modern community would think of tolerating in connection with its sewage-works. If all of the sewage of Natick and South Framingham were filtered through a field five rods away from the bank of the river (under the most ordinary regulation), the amount of organic matter and the amount of infection that would thus reach the river would be as nothing compared with what would come with the unfiltered sewage above referred to, entering the underground stream directly at hundreds of points throughout these two towns, as it would still continue to do after the completion of the proposed work.

It is not always easy to define a water-shed. It is by no means always bounded by the top of the ridge of land bordering it. It is not seldom that a town, lying on a slope belonging to one water-shed, really belongs, so far as its subsoil water is concerned, to another water-shed, for the underground currents are controlled by subsurface-formation, not by topography. A main sewer, built to carry the sewage over a long course, and to discharge near a river not belonging to the Boston basin, would probably deliver enough crude sewage by the way, through leaking-joints, to contaminate seriously the subterranean water-flow of the Boston district.

The report is, therefore, open to the criticism that it evinces too little confidence in the purification that may be effected by the process which it recommends, and has disregarded a source of impurity which is serious at the point of origin, and which may be greatly extended and distributed by the very process recommended to remove it. Sewage cannot safely be carried through a water-bearing, porous soil in sewers of ordinary construction, for these cannot always and certainly be known to be tight.

There can be little doubt that the greatest security — and a much-needed security it is — will be gained by avoiding, so far as possible, all transportation of sewage. It should be got out of the deep ground as soon as possible, and the purifying process should be applied as near as may be to the point of production.

Concerning the danger to which the water-supply is subjected, the consulting engineers say: —

"The sewage must be very thoroughly treated before entering them, to guard against the transmission of disease, liable to be produced by specific poisons or infectious germs. It is not possible to set up an absolute standard for this purpose. Although the water may be clear, and chemical analysis may show it to be of good quality, it can still hold a virulent poison from a previous sewage pollution. Mr. R. Pumpelly has shown, by experiments on the filtering capacity of soils, that otherwise pure water readily carries bacterial infection along with it when percolating through sand and other common materials of the ground."

It is possible that clear water, which chemical analysis would indicate to be of good quality, can hold such virulent poison. There is no evidence to show that water, made clear and pure by intermittent filtration or by irrigation-treatment, does hold such poison, and the probabilities are all against it. Pumpelly's experiments are not at all in point. Those experiments related only prospectively to the filtering capacity of *soils*. The nearest approach to a soil used in any of those experiments was loess taken forty feet below the surface, and in nowise comparable with ordinary soil as a purifier of foul waters. Most of the experiments were made with calcined sand or other sterile media. All that they proved was, that sterilized sand, asbestos, pure charcoal, kaolin and loess will not remove certain bacteria from water filtered through it, and this has nothing whatever to do with the problem in hand.

No instance has come to my knowledge, nor do I believe that an instance has ever been recorded, where sewage filtered through surface-soil, with a reasonable intermittence of application, has ever carried the germs of disease into the subsoil. In investigations made at Gennevilliers it was found that, while the sewage applied at the surface contained over twenty thousand living organisms per cubic centimeter, the effluent taken from the under-drains, through which the purified sewage passes away, contained only a dozen harmless bacteria. One closely-covered, unventilated cesspool, standing within the drainage-reach of a brook, would probably deliver more "germs" in a day, than a well-used irrigation-field of ten acres would deliver to the subsoil stream flowing under it in a year.

The conditions established in the report, for the application of intermittent filtration indicate that, wherever possible, there should be a great depth of well-drained earth between the surface and the permanent water-level of the ground. This is well, of course, as facilitating thorough aeration, and possibly as increasing the future purifying capacity of the area, but it is not imperative. The purification takes place very near to the surface, and it is effected by processes which, under natural conditions, are not active at a great depth. Therefore, while it is advantageous to secure a depth of six feet or more, it is not worth the inordinate cost of heavy grading which such a condition would often imply. A modification of the recommendations, in this respect, would make many an area available quite near to a town, while ground meeting the more rigid requirement could be reached only at much expense, and at the risk of fouling the ground-water with crude sewage in transit.

It would seem that, in this respect, as in some others, too much reliance has been placed on the actual experience of English sewage farms. It should be remembered that these farms were established, and the general method of their management, as well as the theory of their operation, were pitched, fifteen or twenty years ago. As English engineers sometimes fail to adopt new ideas till others have made them old, there has been no recent material modification of the principle of their construction and management. There has, during this time, been a very material increase of knowledge on the subject, and if all the sewage-farms of England could be blotted out, and if the art could be considered anew, in the light of what is now known, some important modifications would be made. Therefore, while the experience there gained is most convincing and of great value, we ought not to regulate the scope and scale of our works according to what we find there.

It is *not* necessary that broad-irrigation farms should be level, or nearly so; it is only desirable. However irregular the surface, and however steep its slopes, it is susceptible of a complete and sufficiently uniform flooding by processes well-known to those who arrange works of irrigation, where even a steep mountain-side is made to receive an adequate flow in all its parts. Then, too, it is important that any system of irrigation should also be *only* a system of infiltration. No sewage should ever, unless by a method securing long exposure, flow to a surface-carrier which would lead it to a water-course; the area covered by the discharge of sewage should be more than large enough to absorb it completely. This is a matter of easy regulation, and there would be no excuse, were such a system adopted, for sewage from any half-well arranged separate system ever reaching a water-course before filtration. The ease with which this restriction could be enforced would be greatly aided by a suitable level tract available for more intensified filtration when the ground might be saturated with rain, or when, for any other reason it was desirable to dispose of the flow differently.

In looking over the whole subject, it seems curious that five gentlemen selected by the highest authority as fittest for the conduct of this study, as well as the three engineers chosen by themselves to aid them, should have failed so signally to acquaint themselves with the present state of human knowledge concerning it. Indeed, they seem, one and all, except for a brief foot-note by Mr. Clarke, to be quite unaware of the existence of the most interesting, the most important and the most useful facts that have ever been established in connection with the purification of sewage by application to land. The literary fancy of the commissioner who wrote the report was inspired by a recognized effect, of which he did not recognize the cause, when he referred to what could be done by "the earth at a

[1] Continued from page 135, No. 534.

touch," but nowhere in the whole document is there more than Mr. Clarke's casual allusion to the now well-known action by which alone this touch is made effective.

So far as scientific knowledge is concerned, this report might have been written a dozen years ago, before such knowledge existed. There is evinced an implicit and all-sufficient faith in the practical authorities of England; while the achievements of the biologists of England, of Germany, and of France, seem hardly to have been suspected. Tyndal, Warrington, Pasteur, Schloesing, Muntz, Koch and others who have developed the true theory of putrefaction and nitrification, seem not to have been thought of in this connection. Yet the practical operations of beer-making have not been more clearly shown to be governed by the agency of micro-organisms than have the practical operations of sewage purification.

The failure to give weight to this new knowledge would be of less consequence — but it would still be of consequence in a learned essay like this — if the neglected knowledge were not necessary to the giving of sound advice. Until very lately we have pinned our faith to "aëration," "oxidation" and "the action of vegetation," and have tried to guess how we might best suit our projects to the methods thus suggested. We now know that, so far as the removal of nitrogenous matters from sewage in the soil is concerned, aëration is a condition, oxidation is an effect, and the action of vegetation is an unneeded sequel to the real purifying cause. The cause itself lies in the life processes of minute organisms which, *and which alone*, compass the complete destruction of the filth that it is our aim to annihilate.

An attempt to tell a community how to get rid of its organic wastes by soil purification which is not based on what is known of these processes — comparatively little though it is — is empirical. Before the facts were known, such an attempt was more than justifiable; now that they are known, it is hardly to be passed over without comment in the case of such thorough and costly work as that under consideration.

Tested by existing positive knowledge, the recommendations of this commission, and the hypotheses on which they are based, are seen to need much reconsideration and modification. In such reconsideration the following facts, among others, should be regarded: —

1. It would be extravagant, under such regulations as would necessarily be enforced in Massachusetts, to adopt the English estimate of one acre to each one hundred of the population. That means providing for an enormous amount of storm-water often for very careless farming, and generally for a very wide margin to spare. If the Massachusetts towns were to be sewered on a strictly separate system, which no English town is, it would be perfectly safe to provide one acre for each five hundred of the population. Indeed, wherever the soil is open and free, this figure might be doubled, and that, too, without interfering with an important agricultural use of the sewage, as at Gennevilliers, where the sewage never flows over the land at all, all being absorbed laterally from ditches, and where the agricultural result has been so remarkable as to increase the rental of the land fivefold.

2. Sewage, as such, is not taken up by crops. Before its fertilizing parts become available for their use, their combinations have been broken down and their organic character destroyed.

3. Sewage does not contain a "virulent poison," using the words in their ordinary acceptation. Its morbific effect is due to organized and living entities. These are not immortal. They are subject to the dissolution that awaits all living things. They seem to be peculiarly subject to the action of the bacterium which produces ordinary putrefaction. Experiments in the Surgeon-general's laboratory at Washington have shown that in the cultivation of specific germs it is as important to exclude the *bacterium-termo* as it is in starting young vegetables to get rid of "pusley." If this greedy scavenger once gains a foothold he sweeps the gelatine field clean of all artificial cultures. There is not the least reason to doubt, and there is much reason to suppose, that in the soil, and in an aërated stream, it performs the same office, except, in the latter case, under very low temperatures. In the soil the sewage supplies the requisite heat even in winter.

4. There is also reason to believe that the organic parts of sewage, like all other organic wastes added to the soil or to the river, or so much of them at least as is not used as food by insects, fishes, etc., is destroyed always *and only* by a process akin to putrefaction. This is a process of oxidation which cannot take place without the intervention of life-processes. This being the case, what we have to provide are the conditions which are best suited to the development of the destroying organism. This involves aëration, it results indirectly in oxidation, and it furnishes pabulum for vegetation, if vegetation is there. The destruction of the waste must take place before roots can act on it. Vegetation is not necessary for purification.

The purification at the Sherburn Prison may be defective. The conditions are difficult — more difficult than was understood when the work was done (in 1879) — but the only evidence of impurity that has ever come to my notice is the detection of chlorides and nitrates in the outflow. It is now known that, from a sanitary point of view, chlorides and nitrates, while they indicate a sewage origin, indicate the annihilation of the sewage character. They are harmless mineral matters, which, if unaccompanied by incompletely purified sewage, may be admitted into drinking-water streams without disadvantage.

5. The process of destruction, under natural conditions, takes place only in or very near the fertile soil at the surface — probably to the extent of at least nine-tenths, within the first six inches, and practically not at all below a depth of twelve inches. We have as yet no means of knowing how far below the surface the activity of the process may be carried by overdosing the surface layer and sending impurities farther down. The indications are that it would never go much below twelve or fifteen inches. Therefore, while an additional four or five feet of loose gravel or sand may facilitate the escape of the purified water and hasten the admission of air, we can get on with much less than this, and it would often be worth while in the interest of economy as well as of fertility, to double the breadth rather than the depth. If this is admitted to be true, the proposed extra expenditure of $45,000 at Westborough is not necessary, and the same condition would probably obtain in other cases considered.

6. The destroying organisms above referred to being active only in the surface soil, there exists, so far as we yet know, no substitute for them in the subsoil, however porous. The danger to our water courses comes chiefly from the leakage of filth at considerable depths, especially of filth which has fermented without sufficient access of air. It is here that we ought chiefly to look for our means of protection. Not only should everything be done that can be done to make local drains and sewers tight and to abolish cesspools and privy vaults altogether, but we should, as far as possible, avoid the risk that inevitably attends the transportation of sewage through deep conduits, as these are practically certain to be made. This may not be avoided within the towns themselves, but it seems most unwise to incur the further risk of conveyance through long collecting sewers.

There are other details which should be regarded in any attempt to solve such a problem as the one in hand, but these are enough to indicate the insufficiency of the work described, and to suggest doubts as to the wisdom of the recommendations made in this report.

Should the subject be taken up again, with due regard to the facts above suggested, the scheme devised will have a much less gigantic aspect; the result will be better, and the cost will be less.

Geo. E. Waring, Jr.

The Illustrations

PRAGUE, AFTER AN ETCHING BY ERNEST GEORGE.

It is much to be desired that more architects should follow Mr. George's example and give us in a permanent form the results of their sketching-trips. He has published several portfolios of etchings, his first volume containing twenty "*Etchings on the Mosel*," which was issued in 1873, being followed in 1875 by "*Etchings on the Loire and in the South of France*," in 1878 by "*Etchings in Belgium*," and in 1884 by "*Etchings of Old London*."

Hamerton says of these: "Nothing can be more honest and genuine than the work in all these plates; there is no attempt in any of them to pass off the result of accident as the result of art; everything clearly is what the artist intended it to be. . . . The principle on which they are executed is simplicity itself." And, speaking of the plate of Angers, Hôtel de Pincé, he remarks, "All construction is thoroughly understood and fully explained. Every important detail of pilaster, cornice and moulding, every changing direction of wall-surface is made quite clearly intelligible, although it may not be drawn with the minuteness of the photograph."

Mr. Ruskin's testimony is also very flattering to Mr. George, and is in the great art writer's most characteristic style. He says, "I call Mr. George's work precious chiefly because it indicates an intense preception of points of character in architecture, and a sincere enjoyment of them for their own sake. . . . I call them precious, in the second place, because they show very great powers of true composition. . . . Mr. George's work is precious, lastly, in its fine sense of serene light and shade as opposed to the coruscations and horrors of common modern attempts in that direction."

In the autumn of 1884, Mr. George exhibited at the gallery of the Fine Art Society in London, a collection of nearly three hundred water-color drawings of scenes in Europe. He is a Fellow of the Royal Institute of British Architects, and as the leading name in the firm of Ernest George and Peto, is well known to our readers as the architect of many successful works, and especially as a designer of picturesque and charming houses. Two of his architectural drawings were in the exhibition lately held by the Salmagundi Club in New York, and the same were afterward seen among the designs shown at the Boston Art Club in a similar exhibition.

ST. PATRICK'S CATHEDRAL, NEW YORK, N. Y. MESSRS. RENWICK & SANDS, ARCHITECTS, NEW YORK, N. Y.

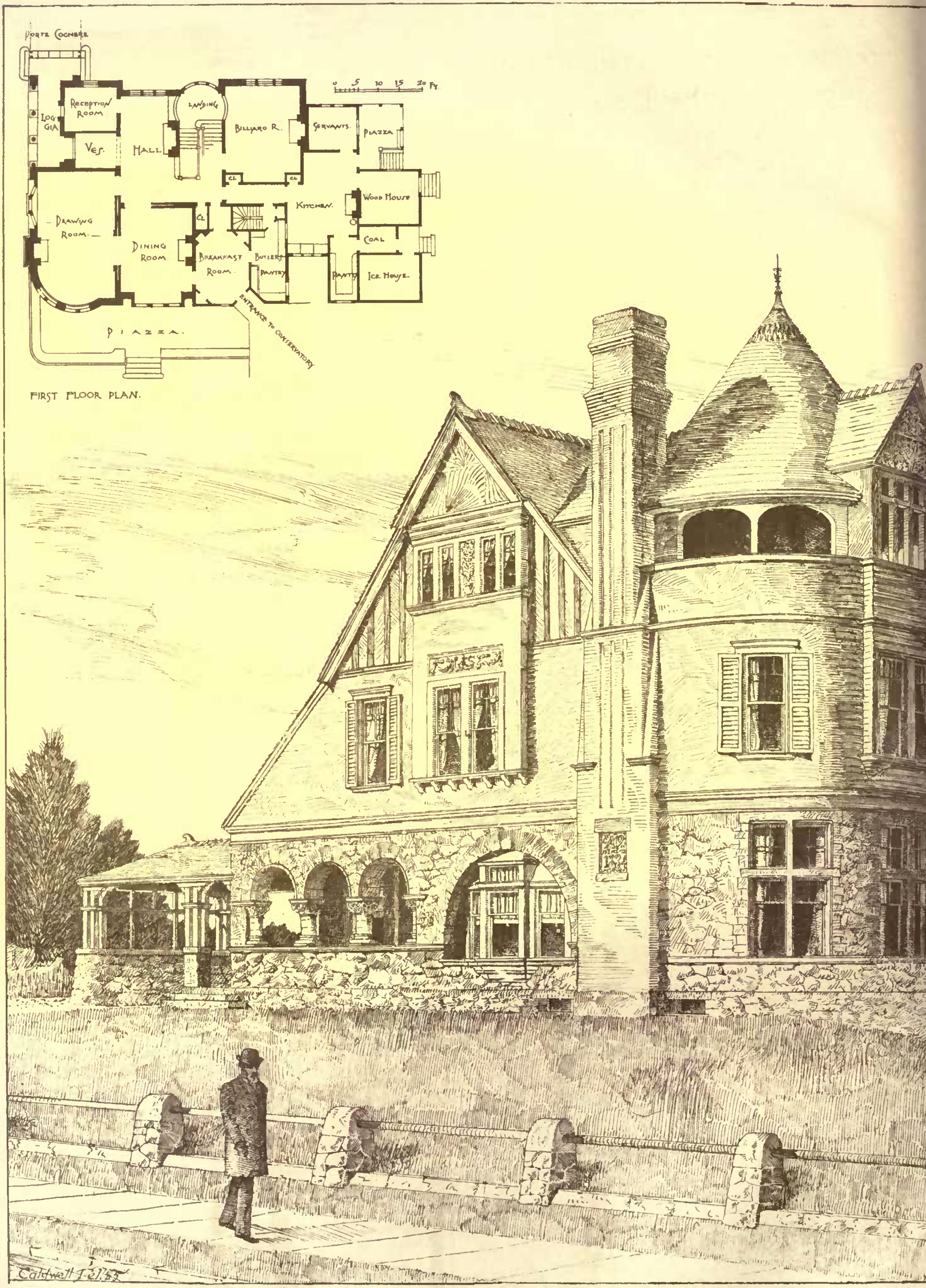
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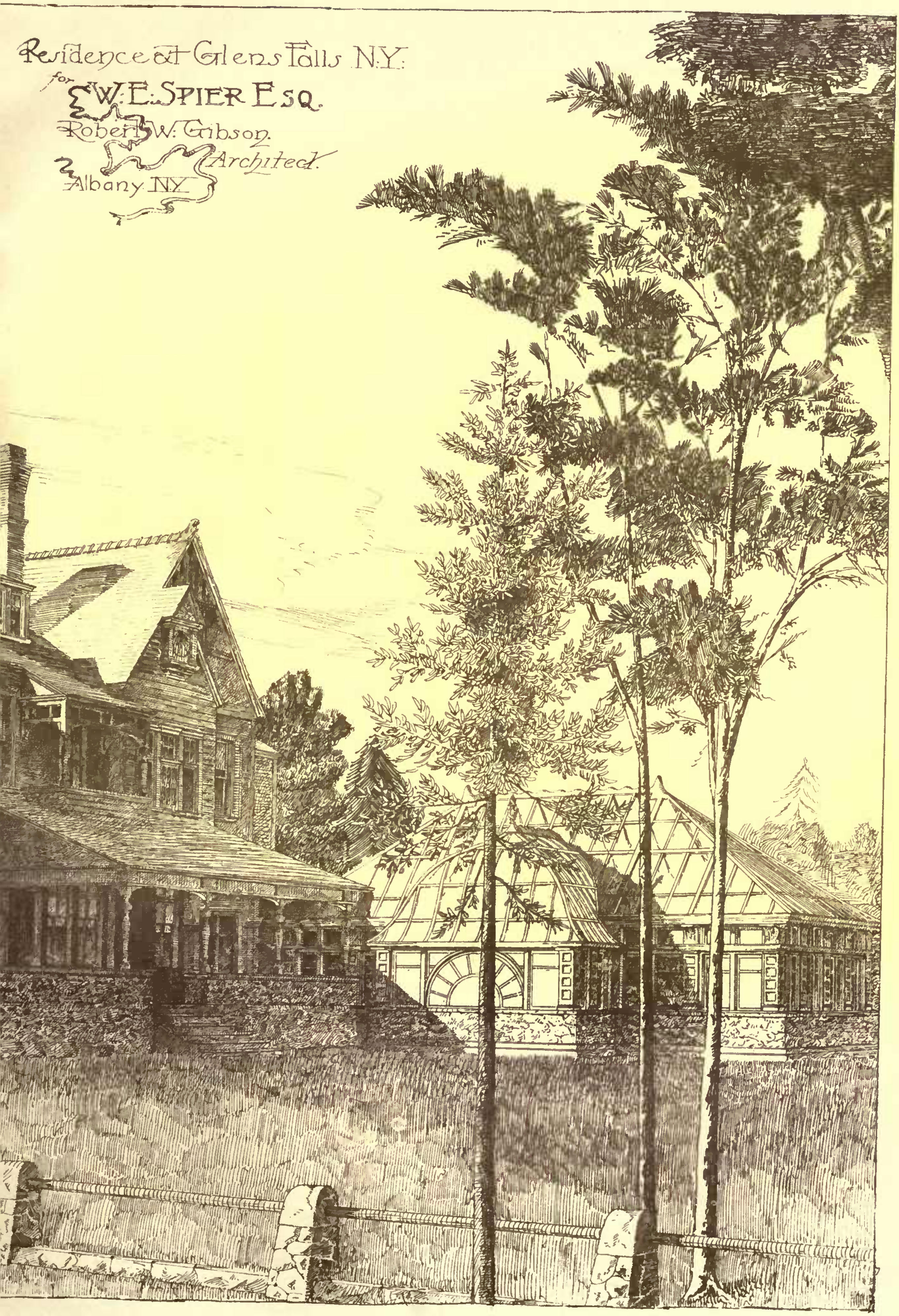
Work on this building began in 1858, and continued, with more or less interruption, for more than a score of years before the building was sufficiently finished for consecration and occupation. The structure is of white marble, and its general dimensions are: nave, 332 feet long, 96 feet broad; transepts, 140 feet by 96 feet; central gable, 156 feet high; western spires to be 328 feet high.

HOUSE AT GLENS FALLS, N. Y., FOR WM. E. SPIER, ESQ. MR. ROBERT W. GIBSON, ARCHITECT, ALBANY, N. Y.

This house is built with lower story of granite in large, bold rubble from split boulders. Upper story: heavy shingles, with chimneys

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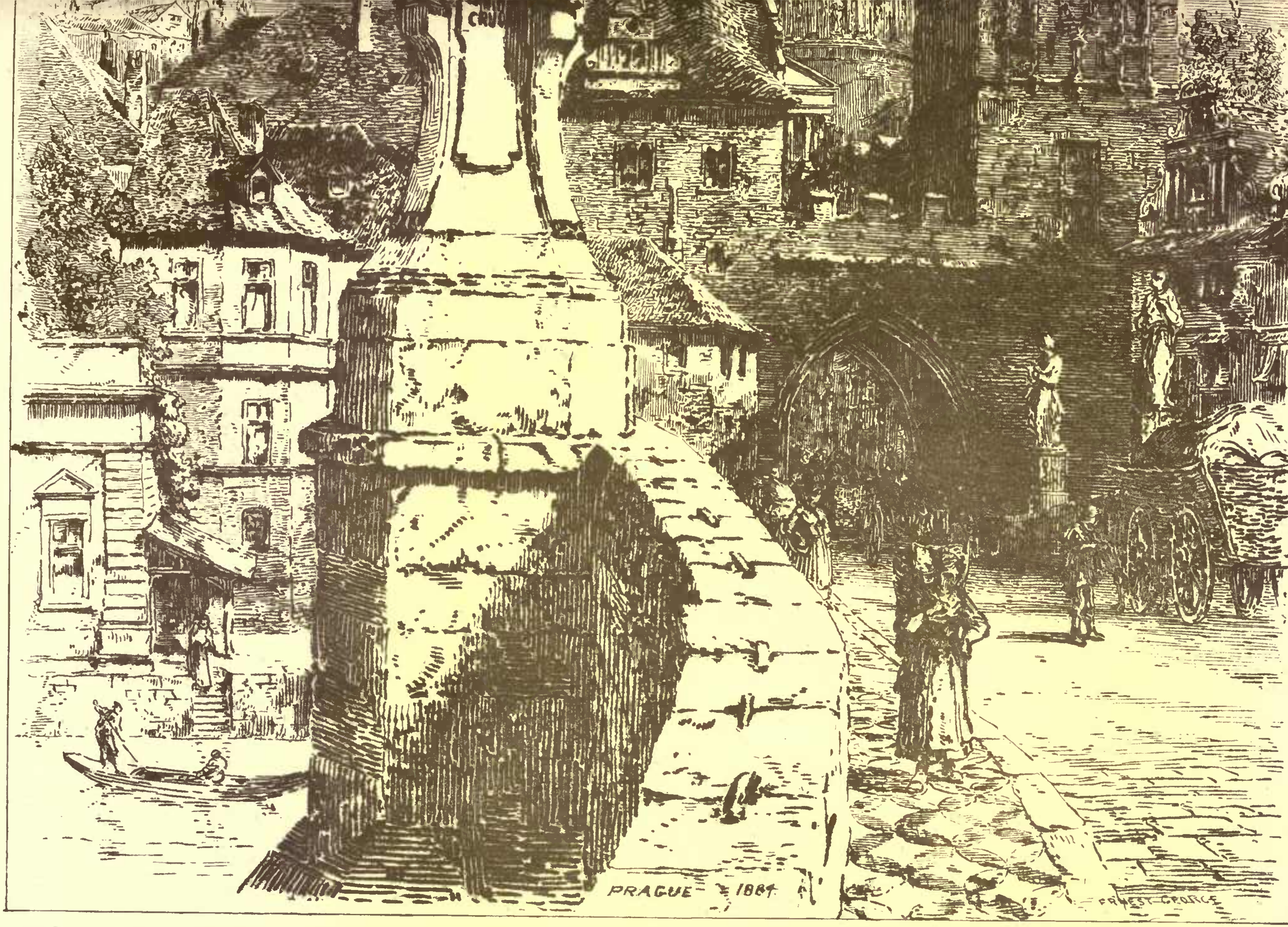
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ST. PATRICK'S CATHEDRAL, NEW YORK, N. Y.

RENWICK & SANDS, Architects.

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of red Glens Falls brick, and roof of red slate. The trimmings, lintels, arches and other cut-stone work are of Longmeadow stone.

INDEPENDENCE NATIONAL BANK BUILDING, PHILADELPHIA, PA. MR. WILLIS G. HALE, ARCHITECT, PHILADELPHIA, PA.

THE base of the building is polished Quincy granite; above is Indiana limestone. Interior: marble wainscot, four feet six inches high, above which the finish is Caen stone. Size of building, 27′ 10″ x 105′. The woodwork throughout is ofmahog any. Cost, including ground, $120,000.

FIREPLACE IN THE CHATEAU DE BLOIS, FRANCE.

THE BOSTON EXHIBITION OF ARCHITECTURAL DRAWINGS.[1] — II.



IN No. 49 we find a singularly gloomy picture, suggesting at first a study in charcoal on an indigo ground, which turns out to be a sketch for the Cincinnati Chamber of Commerce, by Messrs. Burnham & Root, of Chicago. The drawing is clever enough, but the method, as so often happens, was unfortunately chosen; pen-lines in India-ink, washed over with sepia, on paper of a deep nottled gray tint, giving a character of muddy confusion, which the work, when examined closely, certainly does not deserve. The sombre aspect of this drawing is, perhaps, heightened by its proximity to a frame containing two more of Mr. Peabody's delightful sketches, in his Kate Greenaway coloring, near which are two brown-ink drawings of country-houses, by Messrs. Andrews & Jaques. It is hard to criticise these pretty little drawings, of designs so picturesque, but one cannot help mourning somewhat the almost total absence of foreground. There is such a thing as having too much foreground, and the best draughtsmen are noticeably careful to keep their landscape accessories in proper subordination to the architecture; but a certain amount of attention to such accessories is well repaid by the increased force which can be given to the architecture through their means. There is, unfortunately, no book to do for architects what Harding's precious "*Principles and Practice of Art*" has done for painters, in showing them how immensely the attractiveness of their drawings can be enhanced by the application of a few simple principles of composition of lines, and distribution of light and shade; but much may be learned by the study of such drawings as those of Prout, Nash, Harding, Haig and some others, and our architecture will not get the credit that it deserves until the ghostly or ill-drawn foregrounds which usually accompany our sketches give place to a firmer sort of indication, used with a knowledge of the influence of all the lines and shadows on the architectural design whose beauty they can often enhance, subtilely, but powerfully.

The most important drawing on this side of the room is a large pen-and-ink perspective of Messrs. Van Brunt & Howe's competitive design for the Boston Public Library, showing, almost at its best, the clear, though rather formal rendering, and the carefully-studied proportions, which would be expected from them. The wall-surface around it is covered with a particularly interesting group of drawings, executed in all sorts of ways. Prominent among them are Mr. Cabot's handsome colored drawings of his Virginia house, and close by are two most beautiful little color-sketches, by Mr. W. R. Emerson. Mr. Walker and Mr. Chamberlin have colored drawings, one of a house, and the other of the new Cambridge Hospital, both good, but both on smooth paper or cardboard, which always gives a weak, washy cast to colored drawings made upon it, unless an amount of time is spent in picking out details which the importance of the subject rarely justifies. Mr. Walker has tried to remedy this, and give some texture to his picture, by going over the tints with a pen and black ink; but the lines are a little coarse, and the effect not quite happy. Descending in the scale of finish of execution, we find near a sketch by Mr. A. G. Everett, in brown ink, with washes of weak color over the ink. The design of the building shown is extremely pretty and picturesque, and, notwithstanding the slightness of the rendering, the drawing has a roundness, from the skilful strengthening of the tints and shadows toward the centre, which is very pleasing. Two more drawings next in order are in plain line. One, by Mr. Cass Gilbert, of a country house near St. Paul; has a little too much poplar-tree for the best good of the architecture, which seems excellently intended, although a little thrown into the background; and the other, also of a country house, by Mr. Harlow, would be attractive if its author had not hit upon the idea of representing his floor-plan as descending out of heaven upon a cloud into his picture. If well-regulated, this would not have been so bad a notion, but in the present instance the cloud seems to have become uncontrollable, and to have knocked a piece out of the gable of the house, so that the effect is not so dignified as it might be.

Near this we find two out of three or four particularly interesting drawings by Messrs. Rotch & Tilden. Although these are not the first that we have encountered, we like them the best, especially the nearest one — a perspective view of the exterior of the Church of the Holy Spirit, at Mattapan, which is all that a country church should be — sincere, quiet and picturesque. Another church at Bar Harbor, shown by the same architects, although pretty in treatment and outline, shows a large, square, shingled tower at the crossing of nave and transepts, which, rising above the stone walls, suggests too obviously a translation from a familiar stone form to one of wood to be quite satisfactory.

Passing over a number of drawings which call for no special comment, we come to a perspective drawing, in brown ink, of Messrs. Peabody & Stearns's Unitarian Association Building. The drawing is by no means as attractive as the building; the vanishing-points are taken much too near together, and the perspective is, in consequence, so violent as to give an effect of distortion; and the brown ink rendering is treated in a way which might be successful with black, but in the feebler color is disagreeably spotty and ineffective. It is a peculiarity of brown ink that, when laid on thickly, it dries nearly black, while a thinner stratum remains brown; and a cross-hatched shadow, like those in the foreground of this sketch, especially when made with heavy strokes, presents, when dry, the appearance of a network of warm, brown lines, dotted over, where the lines cross and a double layer of ink is deposited, with black specks, entirely out of tone with the rest. A few more pretty sketches, by Messrs. Andrews & Jaques, Rotch & Tilden, W. R. Emerson and Henry Paston Clark, complete the list of local designs, and the remainder of the space allotted to original architectural work takes most of its interest from the English drawings of Messrs. Norman Shaw, Street, Ernest George, James Brooks and Alfred Waterhouse, which were shown in New York, and have already been briefly mentioned. One of these, however — the splendid colored perspective, by Mr. Alfred Waterhouse, demands some further notice. As an example of the application of color to a perspective drawing of a very large building, it is beyond praise, the accuracy of the draughtsman's touch, and the quietness and beautiful gradation of the tints, giving an imposing effect to the drawing, which is rarely obtained in colored architectural perspectives. It is hard to say, on studying the picture, just how its quality of grandeur and atmosphere is obtained, but much seems to depend upon the simplicity of the coloring, and the skill with which the sky-tints and the local colors are made to melt gradually into each other. As is well known, Mr. Waterhouse for many years used but two colors — Payne's gray and warm sepia — in rendering his perspectives, and the absolute command which he acquired over the resources of these two colors seems to have given him an insight into the capabilities of the others such as few men possess.

The last corner of the room is occupied by a collection of designs for decoration, and sketches from nature, which show to great advantage on a wall by themselves. The studies for decoration, although interesting, do not fairly represent the attainments of the profession in that art, and we hope that another year may see greater space devoted to works of the sort. Seven of the drawings are from the Tiffany Glass Company, of New York, the best of them being by Mr. John L. Du Fais. Two out of the seven, by Mr. C. L. Tiffany, we tried our best to like, without success. Both of them are described as designs for room-decoration, and represent elevations of wall surfaces, ornamented in a style which we hope we shall never see carried into execution. One of the rooms appears to be covered from floor to ceiling with little patterned tiles, diversified with large slabs of marbleized slate, while the other presents a mass of lead fretwork, and Moorish entrelacs, and stamped tiles, and pots, and jugs, and plates, which no one, not endowed with a strong constitution, could live among for a week without injury to his nerves. Mr. Du Fais's drawings, at least some of them, show a perception of the value of repose to the eye, and one, representing a design for the decoration of a Music Hall, gives a novel and most beautiful scheme of color, shown in a very effective sketch. Mr. Treadwell, who contributes three drawings, hardly does justice in them to his skill as a decorator. Although the scheme of color in one of them, a design for decoration in a theatre in Buffalo, is clever and characteristic; it is shown in a sketch so glaring and coarse as to offend persons who would probably applaud warmly the executed work. Another drawing, a sketch for a stained window, is much better, but in no way striking. After these, some studies of color decoration in various styles, made by Mr. E. Eldon Deane, as a part of his work in one of the classes of the London Architectural Association, most deserve attention. Although they make no pretense to originality, they are cleverly executed, and show an appreciation of the real beauty of colored patterns that one does not often find in students, and which cannot be acquired by the simple copying of plates out of Owen Jones or Racinet. It is a pity that some such exercises as this should not be introduced among our associations of young architects. There is nothing more grateful to a man, tired with his day's work, than an hour's happiness among beautiful combinations of color; and in these days of household decoration there is no accomplishment more profitable to a young architect than the art of combining colors and patterns with skill. To give point to this reflection, we need hardly do more than refer to two drawings, hung on the wall near Mr. Deane's frame, which bear the modest title of "Studies of Book Illumination." It

[1] Continued from No. 533, page 125.

is evident that their author unites excellent intentions with his modesty, but here our praise must stop. One of the "illuminations" shows a dark-blue ground, "powdered," we suppose we must say, with little suns, and moons, and stars in shell silver, and traced with lines of lettering in the same medium. So far as we can discern, there is neither beginning, middle nor end to the composition, nor interest to the color, although this is nicely laid. The other illumination is, however, worse. In this the artist seems to have had the unfortunate idea of combining a richly-colored initial, on a vellum-colored page, with "powderings" in brown ink. These, by another unfortunate inspiration, take the form of little knots, and cobwebs, and stars scattered over the paper, interspersed with the image of a very rickety and ill-drawn tall clock, a bald-headed bust just falling off the top of the same clock, and some other indications of dilapidated furniture, all in brown ink, with spots and clouds of shadow here and there, which combine with the other brown-powderings to produce an effect reminding one more of the illuminations executed by flies on the pages of the old almanacs in country-hotels than any work of human art. One cannot help applauding Mr. James for his efforts to accomplish something in the beautiful art of illumination, but he has still a good deal to learn on the subject, and if he will continue his study, with the help of such examples as may be found reproduced in Delamotte's and some other books, and in the original in the Harvard College Library and elsewhere, with the taste and perseverance which he has shown in these works of his, he will soon be able, from the height of real knowledge and skill, to laugh at his own early efforts.

The remaining wall-space in the room is filled with sketches from nature, by various architects. The first four on the list, as well as two or three others near by, are by that veteran in the profession, M. César Daly, of Paris, for many years Government architect, and manager of several admirable technical journals. The drawings are all of bits from the cathedrals of Alby or Chartres, and show a facility in sketching, and an appreciation of picturesque effect, which French architects very rarely possess. It is true that, when one takes the trouble to acquire it, as Viollet-le-Duc did, his work is quite equal to that of his foreign brethren, but since the time of Viollet-le-Duc and Daly, the art of sketching seems to have been almost forgotten in France. There is one other French sketch, by Duban, which has the usual characteristics of such attempts, being stiff and cold, like the architectural backgrounds of the early Italian painters. Among the other sketches, most of which are very pretty and well-drawn, the most noticeable, perhaps, are five by Mr. Stanford White, of New York. These, like most architects' sketches, vary greatly in style and mode of execution, the natural tendency of amateurs, who have little opportunity to do such work, being to try all sorts of methods and mediums. In some respects, the best of the five is a sketch of Rouen, from St. Catherine's Hill. There is the trifling difficulty about it, considered from a topographical point of view, that it is not very evident what part of the picture is intended to represent Rouen; but a dusky semblance of two square towers and a tall spire projecting from a large mottled wash of neutral tint, reassures us on this point, and we can then turn, with a clear conscience, to the enjoyment of the picturesqueness of the drawing. Although nothing but a sketch, colored with a sparing hand over a pencil-outline on tinted paper, there is a fire in the way in which the shadows are dispersed over the picture, and an inspiration in the beautiful drawing and coloring of the clouds and sky, which bring one back to them again and again. Probably half the people who look at the sketch remark that it is "like Turner;" and so it is, but the shadowy silhouette of the cathedral in the middle distance, which, vague as it is, conveys the impression of the actual building with striking fidelity, makes it not a painter's, but an architect's sketch, and one in which all architects may take great satisfaction. The best of Mr. White's other sketches is one in pen-and-ink, over light washes of brown ink. The subject, an old tower with a curious entasis, is singularly picturesque, and the combination of the washed-tints, with pen-work so fine as to resemble etching, is very successful, far more so than the coarse and would-be dashing specimens of the same style of work which are seen elsewhere on the walls. Next to Mr. White's, it would be difficult to say which are the prettiest and most interesting sketches, out of the seventy-eight presented to our inspection. A few, however, are particularly noticeable for the success with which some special method is tried; among these being one by Mr. C. Howard Walker, showing a corner of St. Mark's Church in Venice, and done in color on egg-shell paper. This sort of paper, though very rarely used by sketchers, is particularly well-adapted to their purposes. A pencil gives a force of shadow on it which is impracticable with any ordinary paper, while color, owing to its absorbent quality, dries upon it with peculiar softness, giving at once a finish of effect, due to the absence of the rough edges produced by the drying of a tint on more highly-sized paper, which admirably adapts it to the hasty coloring over a pencil-outline, which most architects prefer to the more tedious methods of work. Another drawing, perhaps equally successful, in a different style, is one by Mr. R. D. Andrews, in delicate washes, heightened with body-color, over a pencil-outline on blue-gray paper. Unlike one of Mr. Stanford White's, in the same style, but done on paper so dark that no coloring could make it cheerful that did not cover it all up, Mr. Andrews' picture is delightfully pearly and soft, the half-tint of the ground being just deep enough to bring out the lights clearly, without confusing itself with the shadows.

STUDIES IN THE RENAISSANCE.[1]—III.

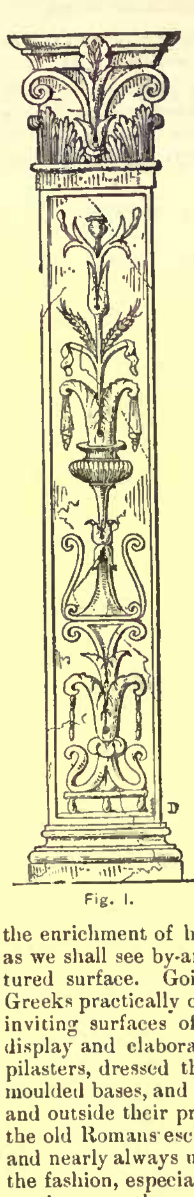


Fig. 1.

THE most interesting branch of study in connection with the Renaissance is, undoubtedly, the development of the arabesque; for in no section of their ornamental work did the revivalists so excel as in the decoration of the panels of the antæ. Antæ, or the slightly projecting fronts of the side walls of Classic edifices, first appeared in a plain form in Grecian architecture, but they eventually developed into a sort of subsidiary column. The Greeks never crowned them with a capital, but provided them with a peculiar base and capping, which, in the Grecian temples, were carried along the intervening walls, thus giving them the appearance of sustaining the architraves, or cross beams, which were between the columns and the walls. The Grecian architects, with their accustomed restraint in the use of ornament, did not think well to panel or fill-in these pilaster-like piers with carved decoration. There are, however, sundry indications of polychromatic treatment, and, doubtless, that embellishment first suggested to the Romans, the purloiners of Greek art, the capabilities of these flat half-columns for such enrichment as we shall consider in this chapter.

To fully understand the scope of arabesque treatment, it should be traced from its origin;— and here we may remark, for the benefit of the uninitiated, that the term "arabesque" must not be taken to indicate that Arab art has anything to do with this class of ornament. The name, which is, we think, unfortunate, was probably suggested by the similarity of such work to some of the elements in the Saracenic style. It really means nothing more than a panel, generally sunk, filled with all sorts of forms, more or less conventionally treated.

Although the examples which are shown herewith are mostly selected from the panels of antæ, the arabesque is by no means confined to the enrichment of half-columns. It crops up in all sorts of places — as we shall see by-and-by — wherever there is an excuse for a sculptured surface. Going back to its very beginning, we find that the Greeks practically offered a premium for its developments in the flat inviting surfaces of their antæ. The Romans, with their love of display and elaboration, gladly seized upon these half-columns and pilasters, dressed them up with capitals, provided them with richly-moulded bases, and altogether encouraged their adoption, both within and outside their principal buildings. It is instructive to notice how the old Romans eschewed nearly all the simpler forms of Greek art, and nearly always utilized the most florid. It is, we know, somewhat the fashion, especially among purists, to decry this selection, or perversion — as they call it — of pure Greek into sensuous Roman. No doubt the Romans did eventually lose that delicate artistic perception — if they ever had it — which was so characteristic of the Greeks; but, when all is said and done, it is somewhat refreshing, after a prolonged study of the severity and comparative nakedness of old Athens, to turn to the richly-clothed Rome of the Cæsars. We would not for one moment throw a stone at the restful simplicity of early Classicism, for its unique beauty is beyond dispute; but when one becomes familiar with its score or so of arbitrary details, the artistic appetite may be excused if it yearns for further food for digestion. We are not alone in thus resenting the finality of Greek ornament. In a recent lecture, Mr. William Morris, a great admirer of antiquity, remarked: "When we think of all that Classical art represents, and all that it hides and buries of its pretensions and its shortcomings, surely we shall not accuse the Fates too loudly of blindness for overthrowing it, or think that the confusion and misery of the times that followed it was too great a price to pay for fresh life and its token, change of the forms of art which express men's thoughts.

"The pattern designs of Greek art, under a system which forbade any meddling with figure-work by men who could not draw the human figure unexceptionably, must have been the main resource of their lower artists, whom we call artisans. They are generally, though not always, thoroughly well fitted for the purpose of decoration which they are meant to serve, but neither are, nor pretend to be, of any interest in themselves; they are graceful, indeed, where the Assyrian ones are clumsy, temperate where those of Egypt are overflorid; but they have not, and do not pretend to have, any share of the richness, the mastery, or the individuality of Nature, as much of the ornament of the earlier periods, and most of that of the later, have had. I must ask you not to misunderstand me, and suppose that I think lightly of the necessity for the due and even severe subordination of architectural ornament; what I do want you to understand is, that the constant demand which Greek art made for perfection on every side was not an unmixed gain to it, for it made renunciation of many delightful things a necessity, and not unseldom drove it into being hard and unsympathetic."

[1] Continued from page 29, No. 525.

We need not pursue Mr. Morris's argument farther, but may proceed at once to observe how the Roman, and, later on, the Renaissance artists filled their panels with "a share of the richness, the mastery and the individuality of Nature," and we do not know of a finer fragment as showing the determination of the former in this direction than that which is shown in Figure 2 of the present series of illustrations. We came across it in the gardens of the Villa Medici at Rome, finely executed in Greek marble, and it shows as vigorous a treatment of the acanthus as could well be conceived. Speaking of the acanthus, it is worth while to notice, *en passant*, that the Greeks adopted the *acanthus spinosus*, or narrow prickly acanthus, while the Romans usually displayed a preference for the *acanthus*



Fig. 2.

mollis, or soft acanthus, the brank-ursine of Great Britain. Here, then, in this Classical fragment, we have the beginnings of the arabesque, and though the artists of the Renaissance, many centuries later, produced more prolific designs and added a variety of fancies, it is doubtful whether they ever handled a piece of scroll-work in a more masterly manner than this. A careful examination of the sketch will reveal the presence of birds, insects and reptiles, variously disposed among the foliage, — most of them are headless, for the drawing exactly represents the carving as it now exists; but sufficient is left to show that the old Romans, long before the *cinquecento*, employed such little creatures for the enrichment of the arabesque. In this example, and others of a similar nature, we certainly get the *motif* of much of the charming decoration which developed some centuries later.

Another source from which the Renaissance borrowed inspiration for this particular class of enrichment was the frescos which adorned the domestic interiors of old Rome. Although the ruins of Pompeii were not discovered until the eighteenth century, there were, doubtless, in other parts of Italy, many scraps of similar polychromatic decoration still extant during the fourteenth, fifteenth and sixteenth centuries, and such scraps revived, like the seed in the mummy-cases of old Egypt which, though buried for centuries, when replanted brought forth plentifully. When once the stolidity and gloom of the intervening, the Middle Ages commenced to give way before the æsthetic revival, the new zeal for classical studies soon began to show results in the brightened appearance of palatial Italian interiors. This spirit of regeneration, which was then bubbling up in artistic, as well as social life, seized upon the arabesque as a convenient outlet for its surplus juvenescence. Not only in the matter of carving, but also in the more facile method of painting, this particular form of enrichment flourished considerably. The adventitious discovery of the Baths of Titus caused walls and ceilings to be covered with colored decorations of the sort there revealed. All kinds of objects were siezed upon and combined, simply for the purpose of obtaining pleasing effects of form and color. Vegetables, and rare vessels, men and masks, shields, and even miniature ships were all thrown together, or rather arranged together, to produce

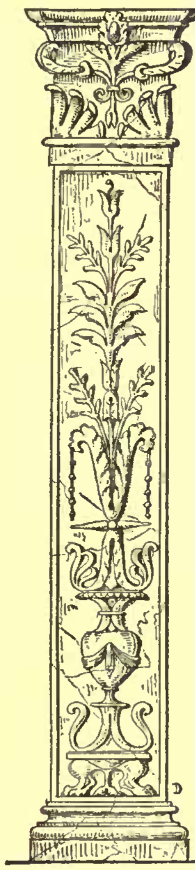


Fig. 3.

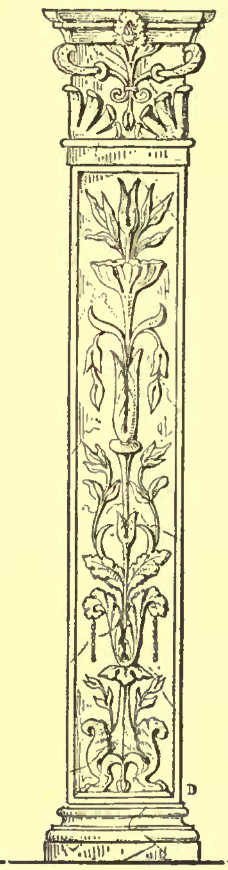


Fig. 4.

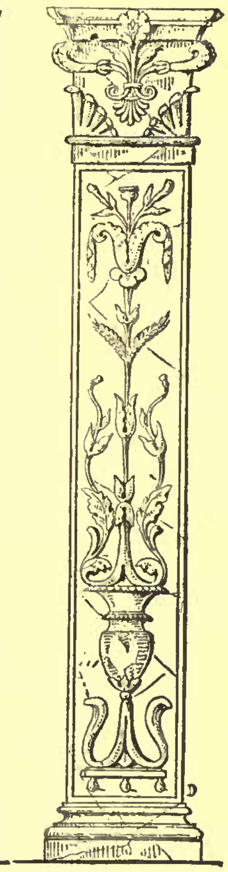


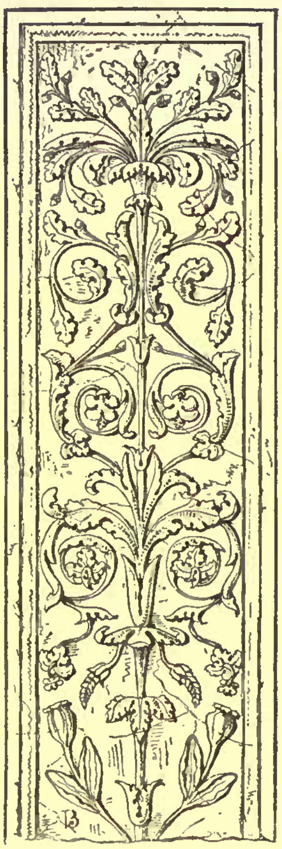
Fig. 5.

happy effects of light and shade. Even the immortal Raphael lent himself to this branch of art, and the celebrated decorations which delight us in the Loggie of the Vatican show us how far he was carried away by this revival of the Pagan æsthetic principle. No wonder that previous styles, with their combination of well-worn lines and perpetually-recurring easily-recognizable borderings, seemed monotonous beside the fresh and highly colored conceits of Raphael, his pupil Giulio Romano, and others of that unfettered school.

Enough has, perhaps, now been said to indicate the ancient sources of the arabesque, and to show that the same elements are at the service of any designer who would do as the artists of the revival did: design a Renaissance panel of his own. "But why trouble about studying or following these classical originals? Such research must be antagonistic to originality!" may be the remark of some of our restive readers. We may answer the exclamation before the query, and we cannot do better than quote the words of Mr. Ralph N. Wornum, one of the most clear and concise of our English writers on style: "The same ornamental types may be used in the development of new styles — the distinction of style depending not so much on the types themselves, as on the mode of using them."

Then, as to the necessity of troubling to understand and follow old details, it will by this time be obvious that no design which is not clearly Classic in its *motif* can appropriate the name of Renaissance. "What's in a name?" some may inquire, with our immortal bard. We are compelled to answer: "Much, every way, as regards style." A lady's bonnet may be ever so graceful in shape, or choice in color-

ing, but if it be made up contrary to all the canons of millinery, and have not yet received the Parisian seal of authority, your lady of fashion will have none of it. Style, it must be confessed, is subject to similar conditions, although we cannot too constantly assert that primary lines need not interfere with even a prodigality of original development. But example is ever better than precept, and we can, by the aid of the accompanying illustrations, see how the Renaissance designers put all these generalities into practice. We shall find that while the leading lines are more or less imitations of what previously existed in such old panels as figure 2, the manner of reapplication gave opportunity for the introduction of many elements which are not to be found in any prior designs. The remark specially applies to the later period of the Renaissance style, which must be considered in a subsequent chapter; in the meantime we can glance at a few of the simpler forms of the arabesques, which were in vogue during the earlier days of the Renaissance. The cloisters of the Convent Aracœli, near the Capitol at Rome, contain some such unpretentious examples. We select figures 1, 3, 4, 5, as useful studies of elementary pilaster decoration. In these designs, well-worn scrolls are combined with vase forms, drapery, wheat, and even seaweed, and while each design differs from the others, there is a general balance of detail which is most satisfactory. This convent contains a large variety of such unaffected enrichment.



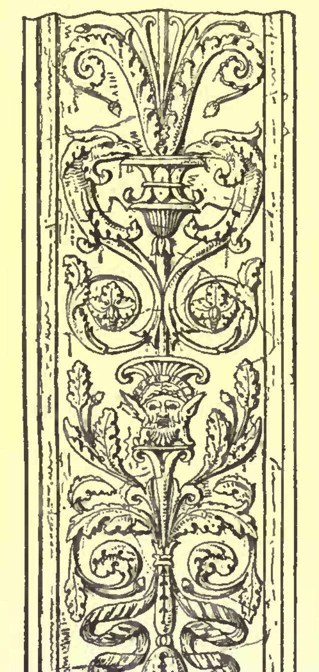


Fig. 6.

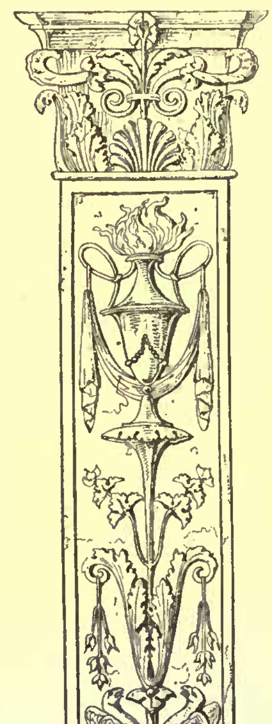


Fig. 7.

As a specimen of something more florid, in which the acanthus plays a leading part, we may direct attention to Figure 6, which was sketched from a white-marble pilaster, in the interesting church of St. Maria del Popolo at Rome. There is in this very little departure from the Roman style, but still it is essentially Renaissance in arrangement.

The remaining example, Figure 7, is a portion of a white-marble pilaster found in the ruins of Adrian's Villa, near Tivoli, and will be useful as affording further illustration of the foregoing remarks. It is evident that the designers of these examples had not the courage to graft many of their own ideas on the classic parent-stem. Examples showing how this restraint was finally thrown off, until the triumphs of the *cinque-cento* were achieved, must be reserved for another chapter on arabesques; in the meantime, and as a useful preparation for the next chapter, we may quote Mr. Wornum:

"The *cinque-cento*, as a critical distinction of styles, does not merely imply sixteenth-century art, but a particular art of the sixteenth century. The term Renaissance is sufficiently definite for a mixed style, more especially as this style belongs to several ages and countries, though more particularly to France, where it has prevailed almost to the exclusion of every other style, but it is of strict Italian origin. There are, accordingly, four Italian styles of the revival — the *tre-cento*, the *quattro-cento*, the pure *cinque-cento*, and the mixed *cinque-cento* or Renaissance. There is one French style of the period — the Renaissance, the same as the mixed cinque-cento, of Italy; and there is one English style, the Elizabethan, which is the English Renaissance. Minor modifications it is unnecessary to notice here. We have made this cursory enumeration for the sake of defining the cinque-cento itself, as practised by Augustino Busti and others, more particularly in the north of Italy, towards the middle of the sixteenth century; the school of Julio Romano, at Mantua, developed it in painting. The prevailing spirit of this style, aiming at a revival of the gorgeous decorations of Rome, naturally threw out all those peculiar, arbitrary forms which are never found in ancient examples, as the scrolled shields and tracery; and on the other hand, elaborated to the utmost the most conspicuous characteristics of Greek and Roman art, especially the acanthus-scroll, and the grotesque arabesques, abounding with monstrous combinations of human, animal and vegetable forms in the same figure or scroll-work, but always characterized, whatever the materials, by an extreme beauty of line. Every natural form, and every conventional or ornamental form of antiquity, is admissible in the pure cinque-cento; it has also this feature — a beautiful variation of ancient standard types, as the anthemion, etc., which occur not only as we find them in ancient examples, but as Italian plants also, treated in the order of the ancient examples. The cinque-cento is considered the culminating style in ornamental art, as presenting the most perfect forms and the most pleasing varieties — nature and art vying with each other in their efforts to attract and gratify the eye. It appeals only to the sense of beauty; all its efforts are directly made to attain the most attractive effects, without any intent to lead the mind to an ulterior end, as is the case with the Byzantine and other symbolic styles. The cinque-cento forms are supposed to be symbols of beauty only, and it is a remarkable concession to the ancients that the moderns, to attain this result, were compelled to recur to their works. And it is only now in the contemplation of this consummate style that the term 'Renaissance' becomes quite intelligible. The Renaissance, or re-birth of ornament, is accomplished in the cinque-cento; still the term is not altogether ill-appropriated to the earlier styles, as these were really the stepping-stones to the cinque-cento." J. Williams Benn.

Traditions Relating to Ulm Cathedral. — Flush with the main wall of the church uprises the tower, an elegant mass of late Decorated Gothic, in which is carried out to greater completeness the idea developed by Master Erwin, at Strasbourg, of pilaster strips before the deeper lying windows, thus effectuating in the tower the idea started by the porch. In this tower, which is easily ascended and which commands an extensive view of the surrounding plains and the distant Swabian Alps, hang a large number of bells, all bearing names indicative of their purpose Some have long been silent, among them one named the "wine bell," once rung nightly at 10 o'clock for the purpose of fetching the male population home from the tavern. On the top is a quaint Latin inscription commemorating the foolhardiness of the Emperor Maximilian, a lover it would seem, of foolhardy deeds — for Innsbruck has a cognate tale to tell — who, ascending this tower, in 1495, leaped upon the parapet, and balancing himself on one leg, swung round the other in mid-air; a truly royal form of recreation. In the tower too, is kept a typical "Ulm-head," the largest tobacco pipe probably ever made, excepting always her majesty's in St. Katherine's docks. Tradition telleth that a student from Tübingen once smoked it empty after a steady pull of nine hours. Tradition telleth not how the student felt afterward. On the roof of the nave sits the image of a huge sparrow, known as the "Ulmer-Spatz," a figure that has sat here from time immemorial as a memento to the Ulmers of the stupidity of their forebears, who needed a bird to show them that a beam carried crosswise could not enter into a narrow gate. — *English Illustrated Magazine.*

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

THE PERMEABILITY OF METALS BY GASES.

GREENVILLE, S. C., March 6, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — As in the study and practice of medicine, so in the study of architecture, there is continuously making itself evident a factor which has a most discouraging effect on the student. The subscriber alludes to the occasional necessity which arises for dispossessing one's mind of some theory previously supposed to be founded on indisputable facts; and, what is still harder, the decision for one's self of some point concerning which acknowledged authorities differ. In fact, in these days of scepticism, how easy is it to sympathize with Sir Walter Raleigh, when, on the occasion of a dispute with some friend about a scene which both had witnessed, Raleigh exclaimed, as he threw his manuscript into the fire: "If I cannot believe my own eyes, how can I expect posterity to believe my writing?" For such reasons as these I am tempted to impose on your valuable space, by requesting some standard authority in regard to the mooted question as regards the permeability of wrought and cast iron by carbonic oxide. This point is discussed in your issue of August 8, 1885, and the authority there is not definite, namely, "A Correspondent of the *Metal Worker*, statements of his experiments go to show that the theories advanced by manufacturers of wrought-iron furnaces are not sustained by actual facts. On the other hand, good authorities — among them Geo. F. Barker, M. D., Professor of Physiological Chemistry, Yale College, state that carbonous oxide passes *readily* through heated cast-iron. Will you not give us some authority for the right of this question — something that can be taken without shadow of doubt?

Respectfully, E. B. RUTLEDGE.

[THE only authority for the statement that oxide of carbon will pass through the pores of cast-iron is, we believe, found in a report made to the French Government by two celebrated chemists, MM. Deville and Troost, who heated a cast-iron cylinder, containing substances capable of generating carbonic oxide, nearly to a white heat, and, after a long time, succeeded in finding a trace of carbonic oxide in the air outside the cylinder. This, they thought, established the theoretical permeability of cast-iron by that gas, although the amount passed through was, at best, so nearly infinitesimal that the experiment would have had no great practical value. Their report was published, as being of scientific interest all over the world, and derived great authority from the eminent names attached to it. The same experiment has, however, been repeated many times since, with a very different result. We have read in some foreign scientific journal, whose name we forget, that, where the test was made with proper care, no trace of carbonic oxide has ever since been found outside the cylinder, and that it is now generally agreed among chemists that Deville and Troost must have been misled, either by some defect in their casting, or by the production of carbonic oxide from the carbon in the superficial portion of the iron itself. After all, the matter is of no great practical importance, although the manufacturers of wrought-iron furnaces try to persuade their customers that it is. There are few cast-iron furnaces properly managed, in which the draught inward toward the smoke-pipe is not always so powerful as to counteract any tendency of the carbonic oxide in the fire-pot to get out of the furnace, instead of going up the chimney, and still fewer wrought-iron furnaces in which it could not get out, not through the pores of the iron, but through the yawning chinks in the construction, if it should ever feel disposed to do so. — EDS. AMERICAN ARCHITECT.]

THE EFFECT OF STRIKES ON BUILDING OPERATIONS.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— The present agitation of the "Knights of Labor," the strikes in various parts of the country and the question of labor generally is undoubtedly of so much interest to you that you may take some notice of the way this agitation affects the building interests. Our daily papers, particularly partisan papers, do not seem to have the moral courage to treat the subject fairly. Their editorials are written to court favor for Blaine and Butler and not to tell the artisans what is to their real interest. You may be able to render the community some service by asking the members of the architectural profession to furnish you with information as to the effect upon them of the strikes.

I, for one, have already lost considerable work by it. Two weeks ago I was called upon by a very wealthy man and asked to prepare plans for a large block of houses which he proposed to erect as a permanent investment. Yesterday he countermanded his order on account of the strikes; he said it was not safe to go ahead with building, as the good builders were not willing to take contracts except at very high prices; besides he would expose himself to annoyances of the strikers, which he could avoid by investing in Government bonds; he would not invest in railroads or buildings so long as the Knights of Labor made such unreasonable demands. I know of two similar instances of the stoppage of building, and I have no doubt that other architects meet with similar experiences, and I doubt whether we can have prosperity in "our line" so long as these agitations retain the formidable influence they exercise. The same may be said of many other branches of the industrial fabric. Large moneyed-corporations, like insurance companies and similar institutions will not be prevented from building, the people connected with them rarely spend their own money in these enterprises, but the average capitalist at present will not readily engage in a building enterprise. The workman ought to be made to understand that this state of affairs must eventually react to their disadvantage, but the greatest sufferers will be a large class of professional men. Workmen can easily "pull up stakes" and go elsewhere if he cannot get work where he is, but men like myself cannot do so. C. P.

[There are many architects and builders who could tell interesting stories about strikes and trades-unions, and many more who would be glad to hear those stories. While it is true that labor troubles check building for a time, we think that in the long run the demand for houses is sure to be supplied somehow. Most architects know that there is apt to be more building when prices are the highest, and nothing is needed except the settlement of the uncertainty caused by the prospect of labor disputes to restore the course of affairs to its normal condition.— EDS. AMERICAN ARCHITECT.]

SHEET-METAL GAUGES.

PHILADELPHIA, March 19, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — We note the letter in your issue of March 13th, signed "Committee-Man," in reference to the measurement of different metals mostly used in building, and beg leave to enclose a list of metals which are generally sold by the gauges under which they are arranged.

There is a difference of from one to two numbers between Stubbs's and Brown & Sharpe's gauges, Stubbs' being the lighter of the two. Although the different materials mentioned are bought and sold almost exclusively by the gauges under which they are placed, it is always safe to order or specify by the micrometer-caliper gauge, which gives the thickness in decimal parts of an inch, and is, therefore, always standard and exact.

There is very little difference between the London, Birmingham and Stubbs gauges, all being used together. The London gauge is the gauge used where very fine numbers are required. All these gauges vary in capacity from No. 0000 to No. 40.

Some materials (such as sheet-zinc for instance) have a special gauge of their own.

There are other gauges which we have not mentioned, because they are very little used.

Yours very truly, MERCHANT & Co.

BROWN & SHARPE'S GAUGE.	STUBBS'S GAUGE.
Sheet Brass,	Sheet-Copper,
Brazed Brass Tubes,	Sheet-Iron,
" Bronze "	Galvanized-Iron,
" Copper "	Brass Wire,
German Silver Sheets,	Copper Wire,
" " Wire,	Tinned-Iron Wire,
Electrical Copper Wire	Galvanized-Iron Wire,
(bare and covered).	Iron Wire,
	Telegraph and Telephone Wire,
	Seamless Brass Tubing,
	Seamless Copper Tubing,
	Kalameined Iron,
	Tinned Iron.

TIN PLATE — Thickness of

IC	is equal to No.	29	Stubbs's Gauge,
IX	" " "	27	" "
IXX	" " "	26	" "
IXXX	" " "	25	" "
IXXXX	" " "	24 1-2	" "
DC	" " "	28	" "
DX	" " "	26	" "
DXX	" " "	24	" "
DXXX	" " "	23	" "
DXXXX	" " "	22	" "

PALM-TREES AS AN ARCHITECTURAL DECORATION.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— On receipt of the *American Architect* for February 13, Mr. James C. Mills, Consulting Geologist, Quincy, Plumas County, California, wrote to the author of "*The Holy Houses, or Solomon's Temple*," the following letter in which he speaks of the palm-trees as an architectural decoration; probably Mr. Mills thought of the words in the *American Architect*, that, on the temple and house of the king, "the bean-pole palms do not amount to much."

QUINCY, PLUMAS CO., CAL., March 6, 1886.

Dear Mr. Paine,— The drawings of palm-trees from the monuments will be truly interesting. They will be, I suppose, abstractions from the date-palm; am I right? I have not seen that particular palm at its best, but the palms of the West Indies and South America are, perhaps, the most impressive features of the scenery there. They are wonderfully varied in form, from the lithe, reed-like rattan-palm to the royal-palm, rising like a gigantic column; and still there is a unity to the impression they make everywhere, just as the grasses, varied as they are, speak always with a certain similarity in the tone of their voice.

Professor Agassiz gives an idea of their unity and variety on page 334, and following, of "*A Journey in Brazil*," and the frontispiece to the same book; and the pictures of the royal-palm on the pages following pages 60 and 61 give as much of the effect of palms as any engravings I can recall.

Of all I have seen in the tropics and warmer temperate zones, the palms have left the most vivid impression on my mind, and the most pleasant.

Now I shall be glad to see what the Egyptians of old time would draw when they tried to figure forth the impression which the palms made on their minds.

The palms are generally of such graceful proportions that you do not appreciate their mere size. I remember well how astonished I was to find what a forest I was in when I first got up by aid of ladders and rope into the top of a cocoanut palm-tree, and when, too, I found that the bunch of nuts I had sawed off from the tree would not go whole into a hogshead. I wanted to take them to the museum at Cambridge.

The picture of the vista down the Alley of Palms, facing page 61 of Agassiz's book, gives an idea of the effect of palms arranged in rows, as they were on the walls of the temple. Mrs. Agassiz says, "I wish it were possible to give in words the faintest idea of the architectural beauty of this colonade of palms with their green crowns meeting to form the roof. Straight, firm, and smooth as stone columns, a dim vision of colonades in some ancient Egyptian temple rises to imagination as one looks down the long vista." These eloquent words recall, but do not express, the beautiful memory of that colonade of palms in my mind — I almost said in my heart, for, like the best impressions of nature generally, this one goes more than mind deep.

What abstractions of the palm the Egyptians and Hebrews made I do not know, except as represented in your work; but I can conceive of no more fitting ornament from the forest or the field for the walls of the Temple than an abstraction that would express the impression which the palms make upon the feelings.

I cannot recall that there were any palms in the Holy Land except on the low lands about the Lower Jordan, and do not know what palms they had in Egypt except the date-palm.

The author of "*The Holy Houses*" would say that the palm-trees on the south wall of Beth Jaär, the Jewish capitol in the time of Solomon (Plate G 8) are copied from Layard's drawings of the stone-cut palms on the walls of the ancient Nineveh: of course foreshortened in Plate G 8. The reader will see that they are conventionalized, or are what Professor Mills terms "abstractions." On the walls of Beth Jahvah, the temple (Plates G 2, G 3), the author had before him the photograph of the palm-tree in Jerusalem growing in sight of the temple's plateau. The gates, much the largest drawings in the book — largest in scale — have the most labored palms (Plates H 3, H 4). These last fill the entire stone surface. For a conventionalized palm-tree the leader might look at "*East of the Jordan*," Merrill, page 51, Castle of Salchad. The writer would gladly have filled all three gallery-walls, and the entire front, with palm-trees of two or three heights, if he could have found warrant in the Ezekiel description; as it was, he drew as many as the language seemed to indicate; but in the gates, the palms touch each other, as already intimated. T. O. Paine.

[The letter which Professor Paine quotes is a very perfect illustration of the inadequacy of descriptive words, and also of the way in which the same object creates different impressions in different observers. Shortly after Professor Agassiz's book was published, we were beguiled into visiting the Avenue of Palms which he has done so much to make celebrated, and we do not recall ever having made a sight-seeing trip which covered our expectations with such an avalanche of dust and ashes. When we read the reviewer's comments on Professor Paine's book, we thought his phrase, "bean-pole palms," eminently happy. However, there are palms and palms, and we hope to publish, before long, a view of palm-trees which possess almost every quality of grace and architectural suggestiveness. — Eds. American Architect.]

NOTES AND CLIPPINGS

Mosaic for the American Church at Rome. — The American Church in the Via Nazionale at Rome has just been decorated with a stupendous Venetian mosiac of a cartoon by Mr. Burne Jones, representing Christ surrounded by the celestial company, as described by Isaiah, Ezekiel, and St. John. In the work which measures 962 square feet there are no fewer than sixty figures, some of them three yards high, while the reproduction of the grand coloring is regarded as a triumph of mosaic art. The difficulties to be overcome in the tints were very many, for in the composition are represented the sun, the moon, a rainbow, sky, water prophets, evangelists, angles, and the Divinity with all its glories and atributes. — *New York Evening Post.*

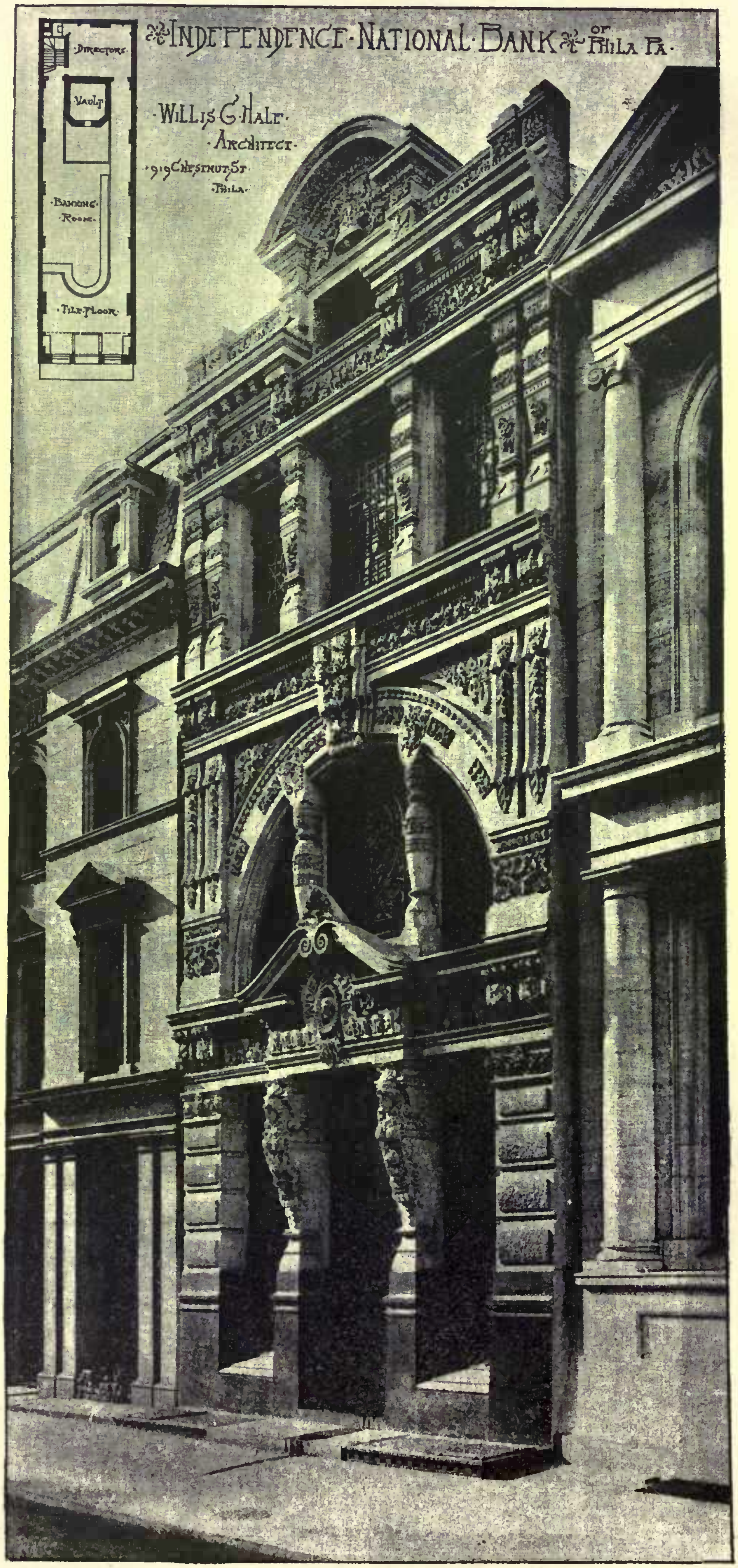
Baudry's Pecuniary Rewards. — Baudry lived too much within himself to be a pleasing companion to any one who did not know how to draw him out. With any one who did, his conversation was enchanting. People generally found him dry and uninviting. In personal appearance he was short and dark, had a nose that was a compromise between the straight and aquiline, the blackest and softest eyes imaginable, a bilious complexion, and a brow that seemed to ache from some secret care. He had very little talent for arranging his shop-window or for getting himself puffed, and he was not mercenary. The ceiling of the opera-house salon brought him a wretched pecuniary reward. He told me that he did not altogether make more than £800 out of it. When he undertook it he drove no bargain, and he was under the delusion that the Lorenzo d'Medici type of art-patron was not extinct. Vanderbilt did not pay him very handsomely for the beautiful work which he did for the palace of that arch-Dives in Fifth Avenue. Nor did the Duc d'Aumale show himself very liberal in the sum he paid for the "Conversion of St. Hubert." The painter also had the mortification, when he accepted the order, of learning that he was to bring into the picture members of the Duc's family whose heads do not lend themselves to pictorial effects. Some rivals were furious with Baudry, because his respect for the dignity of his art did not prompt him to reject the Chantilly order. This was nonsense. Art must bring grist to the mill, for which reason those who live by it must extract, as well as they can, money from the pockets of the wealthy. Baudry, having a heavy rent to pay, was glad to hold a candle to the Orleans princes. In doing so, he obtained numerous orders from opulent royalists, and the patronage of some great financial barons, and of Vanderbilt. They all believed in the connoisseurship of the Duc d'Aumale. — *London Truth.*

A Deep-Sea Lighthouse. — A few years ago it was proposed by Mr. C. Anderson, of Leeds, to construct deep-sea lighthouses in the form of a large cylinder of wrought-iron 290 feet long and 36 feet in diameter, having a tower rising 140 feet above the water, and fitted up as a lighthouse. The middle part was to be made unsinkable by a packing of buoyant material, and the lowest part was to be ballasted. A new plan, invented by the late Captain Moody, has been illustrated by a large model constructed at the Barrow Ship-building Company's yard. It consists of a central vessel of iron or steel, divided into water-tight compartments, and having four rays projecting from it. An iron bulwark runs round the vessel, and scupper-holes are specially provided to carry off storm-water. The vessel is anchored by four cables running from between the rays; and in deep water the cables would be moored to buoys anchored in the sea. In shallow water the cables run direct to the mooring-anchors. A telegraph-cable, connecting the vessel with the shore, runs through a hole in the centre of the hull, so as not to be fouled with the anchoring-cables. A lattice-tower of steel starts from the hull, and is to be fitted with a lantern 60 feet above the water-line. The length and breadth of the central hull in actual practice would be 80 feet. Every accommodation for the lighthouse-keepers and telegraphists would be provided, together with a sufficiency of stores. The hull is of an arched or curved form to resist the waves better; and, owing to its form and mooring, it can also keep its position in any state of wind and tide. The model which was recently tried successfully at Barrow is to be submitted to the Trinity Board, and sent later on to the Shipping-Exhibition at Liverpool. The question of ocean telegraph and lighthouse stations is, no doubt, a very important one, and it is likely enough to be realized in the future. Already we have a step in that direction in the case of the light-ship off Walton, Essex, which is in communication with the shore by a cable some eight or nine miles long, laid by the Telegraph Construction and Maintenance Company, and worked by telephone and telegraph. Quite recently it did prompt service in calling out, and subsequently stopping the district life-boat before it put to sea, owing to the fact that the vessel which was in distress had succeeded in getting off the "ground" before the life-boat was launched. — *Engineering.*

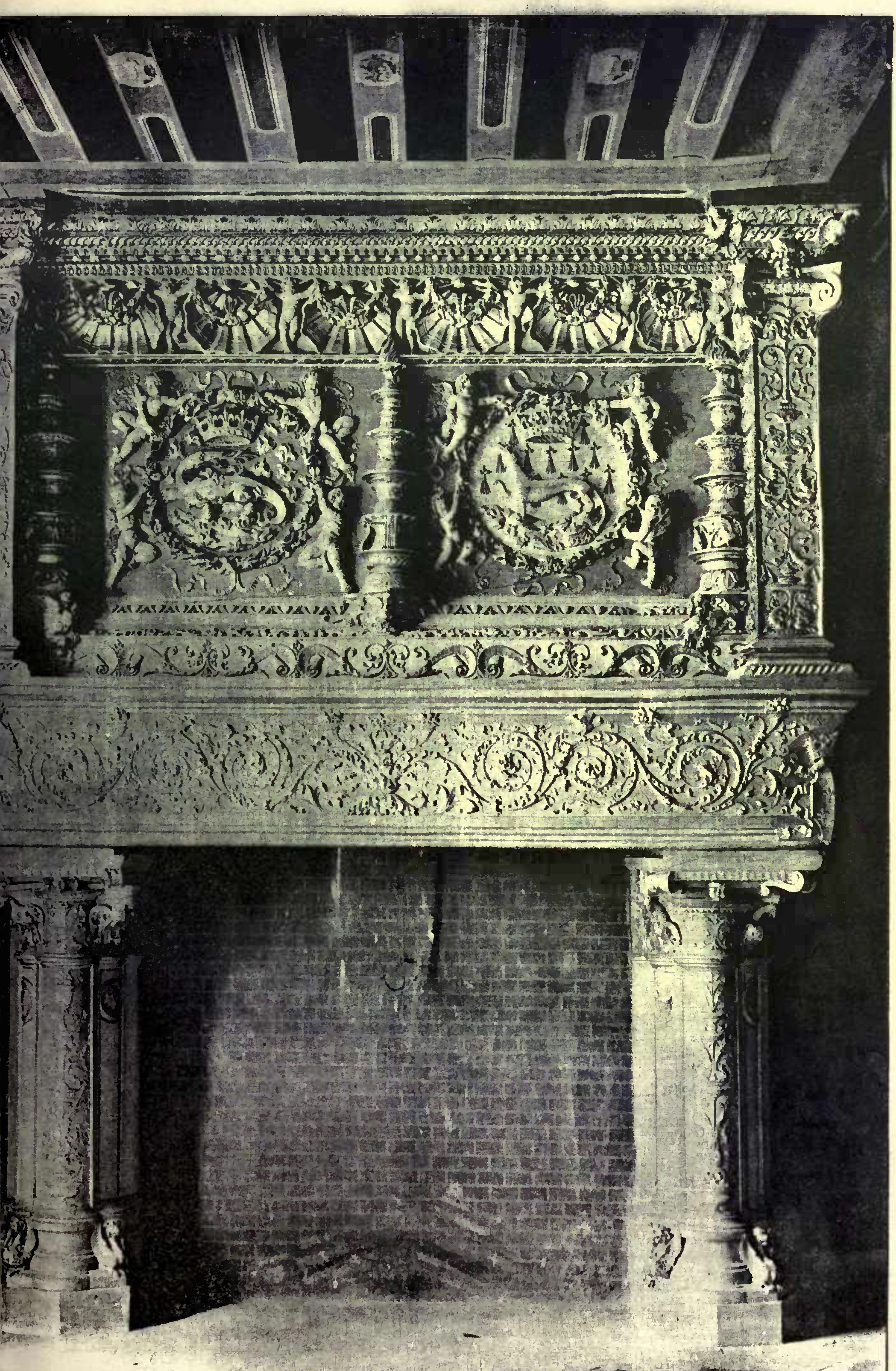
Repairing a Lock-Floor. — An ingenious means of making good damage done by water getting under a lock-floor, without using coffer-dams and laying dry the dock, has been successfully tried on the Zuid-Buveland Canal, and is quoted in the "*Foreign Transactions*," published by the Institution of Civil Engineers. The lock in question rests on a pile-foundation, supporting a timber floor on which the brick-work walls are built. The natural soil consists of fine running sand. For some time the earthen backing to the lock-walls was found to be giving way, and considerable silting up had taken place in the canal-bed, just outside the lock-chamber. A hole was found in the apron of the lock-floor, and there was a hollow underneath the floor itself. This was at first filled with puddled clay, but it had all been washed out again shortly after, and the sinking of the ground continued. Coal-tar was then pumped down through a tube near the apron, at the upper side of the lock-chamber. This passed under the floor to the lower side, showing that continuous hollows existed under the lock-floor. An unsuccessful attempt was made to fill these by forcing down water and sand. It was then discovered that the timber-piling was attacked by teredo-worm, and that even the floor was not free from it. In 1882, it was determined to fill the hollows with concrete, of one part Portland cement, to five parts sand. Eight holes were bored through the lock-floor, and the concrete was forced down through a tube so as to completely fill the space between the original soil and the underside of the floor. Thirty-seven mètres cube of concrete was the quantity used, and this formed a hard mass underneath the floor. The traffic was only closed about seven weeks, and the cost of the work amounted in all to £177. — *The Builder.*

History of the Torlonia Fortune. — The history of Prince Torlonia, whose death was announced yesterday, is a series of surprises. The family were of French origin, and came from Auvergne, the original name being not Torlonia, but Tourlogne. The founder of the great banking family was servant to Cardinal Aquaviva, who in his will left him a provison for the rest of his life. The valet invested the money in lace and needles, and did a good trade with these small wares, and was able to educate and push forward his son, who early showed decided ability for finance. He was patronized by Pius VI., and employed by him to carry out a series of monetary operations, all of which were brilliantly successful. The name of Tourlogne was now abandoned, and Giovanni Torlonia founded a bank, and money multiplied with him. On his death, in 1829, he left his son, Alexander Torlonia, a fortune of 40,000,000 francs. Alexander inherited not only his father's wealth, but also his capacity for business. The 40,000,000 francs invested in the purchase of a monopoly of tobacco, stretching over thirty years, increased enormously, and Prince Torlonia found that, while the other Roman nobles were growing yearly more impoverished, money was fructifying in his coffers. He employed it in princely hospitality and in ventures of enormous magnitude, and both methods of investment were prosperous. The draining of the Lake Fulcino, a work which several of the Roman Emperors had commenced and abandoned, was successfully carried out at a cost of 35,000,000 francs, and Victor Emmanuel celebrated this great engineering achievement by presenting the Prince with a gold medal specially struck for the occasion. The Prince's enormous wealth passes to his daughter, married to one of the Borghese family, who takes the name and title of Torlonia. — *Pall-Mall Gazette.*

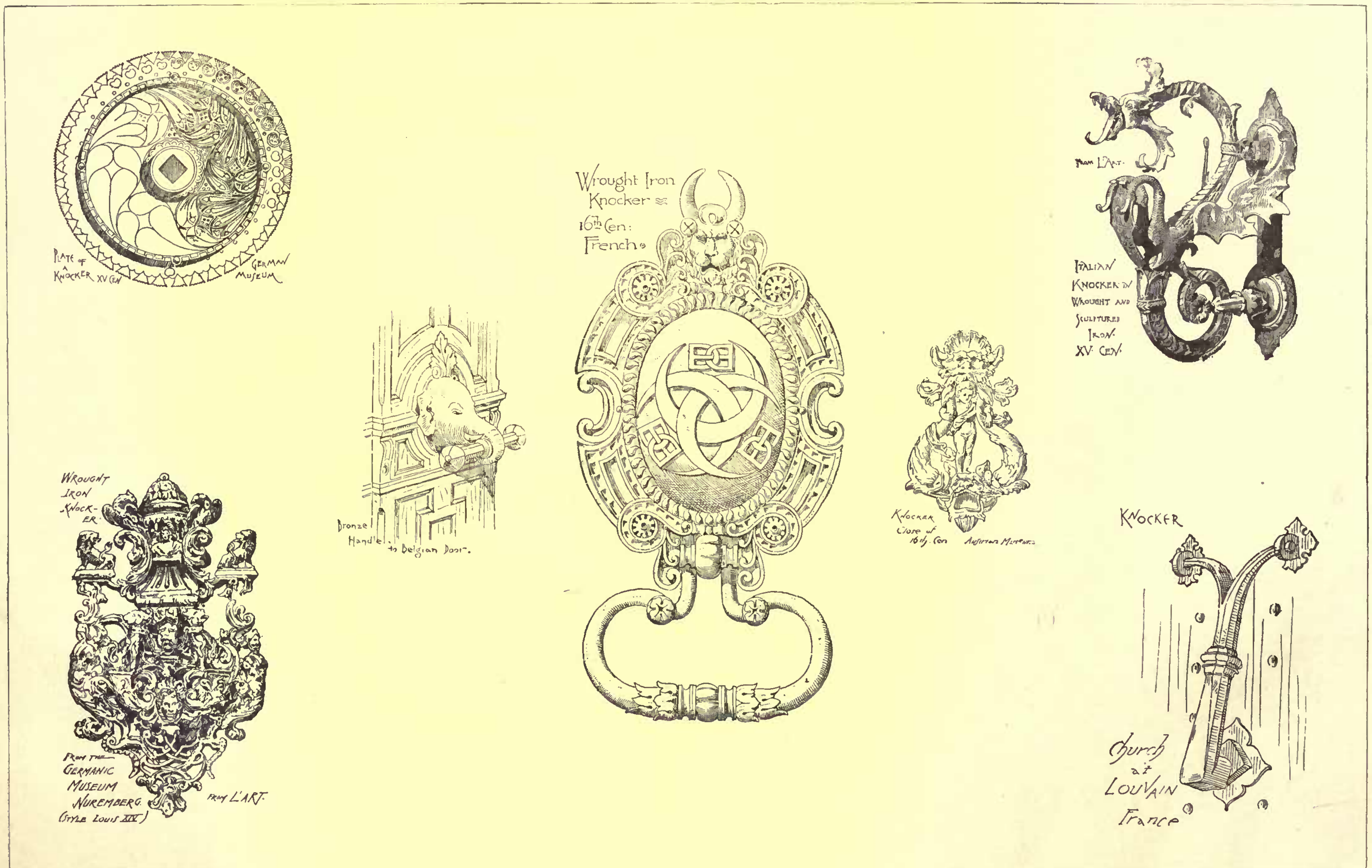
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Chimney piece in the Château de Blois.


Plate of a Knocker XV Cen
German Museum
Wrought Iron Knocker
From the Germanic Museum Nuremberg (Style Louis XIV)
From L'Art
Bronze Handle to Belgian Door.
Wrought Iron Knocker 16th Cen: French
Knocker Close of 16th Cen
From L'Art.
Italian Knocker in Wrought and Sculptured Iron. XV Cen.
Knocker
Church at Louvain France

KNOCKERS.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 536.

APRIL 3, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

CONSIDERING the variety and seriousness of the risks to which mills, filled as they are with valuable but combustible materials, are exposed, it is almost surprising that any-one should be found courageous enough to insure them. During the past year, which was an unusually favorable one, eighty-six fires occurred in the seven hundred and fifty factories or other buildings insured in the Boston Manufacturers' Mutual and the Spinners' Mutual Companies, or in nearly twelve per cent of the whole. Yet the loss in all these fires put together was only thirty-four thousand dollars, or about one twenty-fifth of one per cent on the amount at risk. It would seem, at first sight, that, independent of the risks from friction of machinery, spontaneous combustion, and so on, a fire in a cotton or woolen mill, consisting of a few immense rooms, through which a fire could spread rapidly by jumping from loom to loom, must be usually much more destructive, in proportion to the size and value of the building and its contents, than a fire in a dwelling-house, divided by plastered partitions into a great number of small rooms, most of which would contain comparatively little combustible material, and a generation ago this was the opinion of underwriters who, we believe, usually demanded a premium of two per cent a year for insuring a cotton-mill, and considered them unprofitable risks even at that rate. An insurance agent of that time, who should have predicted that in thirty years a premium of one-fiftieth of that amount would, exclusive of the cost of managing the business, be found sufficient to cover the fire losses in a hundred million dollars' worth of such buildings, without any costly change in the method of constructing or carrying them on, would have been looked upon as a madman, and we doubt if even the officers of the factory mutual companies themselves quite appreciate the extraordinary work that they have accomplished. To put the matter in a different way, let us suppose that some enterprising person should make a contract with the owners of a hundred million dollars' worth of shoe-factories, paint-shops, and the other bad risks which still pay an annual premium of about two per cent, under which they should agree to pay him this premium for thirty years, and he should promise, in return, to make at his own expense all improvements in construction and equipment which he thought advisable for checking the spread of fire in their buildings, requiring of them only reasonable promptness in using them, and should agree further that at the end of the thirty years any surplus remaining over the actual cost of making good the fire losses during that time should be equally divided between himself and his policy holders. That such a proposition, from a responsible company or individual, would be eagerly accepted by thousands of property owners seems to us hardly doubtful, yet a moment's reflection will show that the labors of the present factory mutual companies have rendered it possible to make such a transaction enormously profitable to the insurers as well as to the policy holders Taking the cost of providing automatic sprinklers, wire-lathing and plastering ceilings, removing wooden cornices and furrings, with the lesser changes required by the mutual rules, at ten per cent on the value of the buildings and contents, the insurer would have to lay out immediately ten million dollars, which, with simple interest at six per cent, would amount in thirty years to twenty-eight millions. The outlay for reimbursement of fire losses at the mill mutual rate for the last year, would be forty thousand dollars a year, amounting with interest at the end of thirty years to two million two hundred and eighty thousand, making a total outlay of thirty million two hundred and eighty thousand dollars, exclusive of the insurer's expenses. The premiums during the same period would amount with interest to one hundred and four million dollars, leaving a net surplus over the outlay of seventy-three million two hundred thousand, half of which, or thirty-six million six hundred thousand dollars, being more than one-third the value of their mills and their contents, would be handed back to the policy-holders, while an equal sum, representing a profit of more than a million dollars a year after allowing six per cent interest on the capital invested in the business, would belong to the insurer. At compound interest the gain would be larger by many millions, and yet the policy-holders would in the end have paid only one-half the regular rates for their insurance, and would have had the salable value of their property increased from the very beginning without cost to themselves, by at least the value of the improvements made upon it. The cost of inspection, salaries of officers, rent, taxes and so on for carrying on an insurance business of this magnitude could easily be estimated from that of present associated factory mutual companies, which insured last year four hundred and six million dollars worth of property, at a total expense for everything except payment of losses, of two hundred and fifty-seven thousand dollars. At the same rate, the cost of the business of insuring and inspecting one hundred million dollars worth of property would be about sixty thousand dollars a year, or for thirty years, including interest, three million four hundred and twenty thousand dollars, leaving a balance of thirty-three million one hundred and eighty thousand dollars as pure profit, the only investment of capital necessary, that of the ten millions needed for improving the construction of the buildings at the outset, being separately repaid with interest, while all current expenses and payment for losses, would be provided for out of the income from premiums.

ONE of the most interesting fires which we find described in the above-mentioned reports occurred at Plymouth, Mass., in a cordage factory. One of the buildings belonging to the factory was used as a picker-room, and stood between two larger buildings, distant about forty feet from each, but communicating with one by means of a closed wooden bridge. One of the larger mills was fitted with automatic sprinklers, and sprinklers of the same sort were being put in the picker building, in place of the perforated pipe sprinklers which had previously protected it. The perforated pipes had been removed, and the new supply-pipes for the automatic sprinklers put in their place, but the men had left the work on Saturday afternoon without screwing on the sprinkler-heads, intending to return Monday morning and put them in place. The picker room was thus left for the moment unprotected, and, to make matters worse, several barrels of oil had been brought into the room to keep them from being chilled. About four o'clock Saturday afternoon, the very common accident of some hard substance striking fire in the picker occurred. The stock in the picker, consisting of manilla, softened with a little oil, took fire, and the flames quickly spread to all parts of the room. A large cast-iron steam-pipe passed through one corner of the picker-room, and while the fire was raging this pipe broke, allowing great volumes of steam to escape into the room. After struggling awhile with the fire in this room, the manager sent men to the mill which was connected by the bridge with the picker-room, to see if there was appearance of danger there. Although this mill was protected by sensitive automatic sprinklers, the men returned, saying that it was on fire "all through and all over," and, together with the picker building, it was totally destroyed. The remaining mill was fitted with perforated pipes, and by turning water on the building was saved.

THE explanation of the sudden outburst of fire in the Number Three mill should, according to the report, be sought in the phenomena attending the combustion of oil or oily matter in a closed room. Under such circumstances an immense amount of gas is generated, which will burst into flame of oxygen is supplied, but in the absence of sufficient oxygen idiffuses itself unchanged. The breaking of the steam-pipe while the oily manilla, and perhaps the oil in the barrels, was

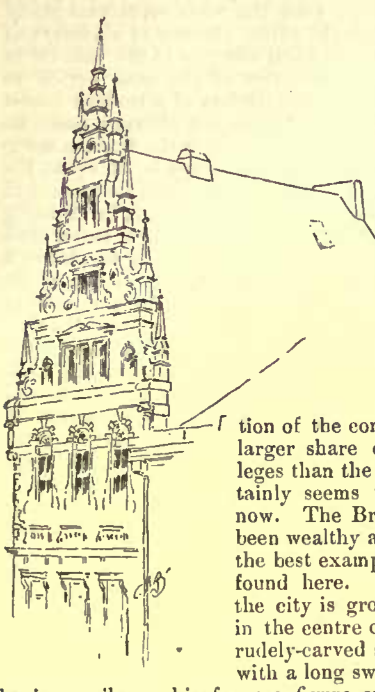
burning, admitted steam enough under pressure to drive the combustible, but unconsumed gases from the oil out of the room by the most available path. The bridge to the Number Three mill afforded the easiest means of escape, and the smoke and gas poured through it, meeting, when it reached the large rooms of the mill, with a fresh supply of oxygen sufficient to cause it to burst into a flame so fierce and sudden that the sprinklers could do nothing against it. In another fire, in Fall River, where a mill provided only with perforated pipes took fire, it is worth noting that the city fire-engines, on arriving at the scene, were utilized with excellent effect, not in throwing a large stream of water taken from the city pipes close by, and thus depriving of their supply the sprinkler-pipes, which were being efficiently managed by the mill officers, but in drawing water from a pond near by and forcing it into the sprinkler feed pipes, which had been provided with a connection, like that of a stand-pipe, for this express purpose. To the prudence thus displayed by the city fire-engineers and the mill officers is to be attributed the saving of the mill, a huge five-story building, which, although marks of fire were subsequently found in the second, third and fourth stories, was not very seriously damaged.

BEFORE the discussion upon the rights and wrongs of labor, which is now progressing so actively, dies away, we should like to call attention to the remarkable speech of M. Alphand, the Director of Public Works in Paris, delivered before the association of mechanics and builders on the occasion of the annual banquet and distribution of medals to the oldest and most faithful workmen in the various trades in the city. M. Alphand, who is a very energetic and able man, has made himself rather conspicuous lately by his successful opposition to the communistic propositions for the enforced reduction of the hours of labor, and the increase of wages, in the Municipal Council, and his address, pronounced at the dinner, over which he presided, seems to have been intended as a defence of his course. That it was a convincing one is shown by the enthusiastic applause with which it was received, and his arguments were so excellent, and so well presented, that we are sorry not to be able to give them in full.

BEGINNING by reminding his audience of the fifty years during which he had been engaged in building-operations, M. Alphand claimed that his long and friendly relations with workmen in the building trades, not only in his civil capacity, but as the commander of a legion entirely composed of architects, builders and workmen, which served in the war of 1870, entitled him to speak for them and to them truthfully, and to show them where, in his opinion, they were deceived by their self-constituted leaders, and in what way they could, if they wished, advance toward the amelioration of their lot. Believing, as he did, that it was the duty of the experienced and well-to-do to protect the interests of his more dependent fellows, he considered it a matter of the first necessity to combat, by all means, the four great errors contained in what were put forward as the claims of the working-classes. The first of these errors, and the most serious, in his opinion, was involved in the idea of uniformity of wages. A uniform scale of wages meant simply the reduction of the income of the good workmen to that of the bad ones; the result of which would be, that the good workmen, finding that their industry and skill were useless to them, would relax their efforts, production would diminish, and the world would grow poor. The second error was that of desiring the limitation of working-hours. For women and children, and in certain industries, such a limitation was necessary to preserve the health of the workers from being sacrificed to their ambition, but a restriction placed on labor with any other object he believed to be a burden, to which Frenchmen would not long submit. In proof of this he said that, since 1848, two laws of the kind had been passed, neither of which had been enforced; and he predicted that no such law, not in the interest of health, could ever be enforced in France, until the character and customs of the country were wholly changed, and the love of liberty inborn in the French race had been destroyed. The third error—that of imagining that the arbitrary raising of wages would be an advantage to the workmen—M. Alphand dealt with very cleverly. If, said he, Paris were a walled town, without commerce, there would be no harm in raising by law the rate of wages. The result would simply be that the prices of everything consumed by the workman would rise in exactly the same degree, so that he could buy, with his large income, just what he did before with his small one, and nobody would be any better or any worse off than before. Unfortunately, however, Paris was not a walled town, but a great manufacturing centre, competing desperately in the markets of the world to sell its goods and keep its inhabitants employed; and the result of a local increase of wages would be to raise the cost of all goods manufactured in the city, preventing them from competing with those of other cities and destroying their market, and with it, the manufactures on which the citizens depended for their living. The fourth error—that of imagining that the working-man would find advantage in driving off the elements of design and supervision by which his work was guided, as well as the capital by which he was maintained until his work was completed, and the product of it sold at a profit—needed no special explanation, and M. Alphand concluded by calling upon his audience of architects, builders and contractors, to interest themselves in the real improvement of the condition of the poor, the road to which must, for the present, he believed, lie through the lessening of the cost of living, the formation of benevolent societies, and the provision of pensions or annuities for the old and helpless.

MR. GEORGE KELLER, of Hartford, writes to call our attention to an oversight which was made in one of our accounts of the designing of the wings of the Capitol at Washington, in neglecting to call attention to the connection with the work of Mr. Charles F. Anderson, a New York architect, whose plans received one of the four equal premiums awarded as the result of the competition of 1850 for the extension of the building. No one of the four plans was, however, entirely satisfactory, and the Committee on Public Buildings employed an architect of their own, Mr. Mills, to make a new plan, combining the advantages of all the others. The Mills plan is apparently lost, but the description given in the report of the committee indicated that it corresponded pretty closely with Mr. Anderson's design. While this was going on, President Fillmore, in pursuance of authority given him by another act of Congress, had what seems to be still a different design made, resembling Mr. Anderson's slightly in elevation, but differing entirely from it in arrangement. The act authorized the President to have the plan approved by him carried into execution, under the direction of such architect as he might appoint, and something seems to have been done on the ground when a resolution of the Senate was passed, Calling upon the President to "communicate to the Senate any plan which may have been adopted for the extension of the Capitol," and demanding also information as to the method in which the principles of heating, lighting, ventilation and acoustics were complied with in the design. A year later, the supervision of the work was transferred to the War Department, and Captain (now General) Meigs was appointed to the post which he filled with such signal efficiency. In conference with Professors Bache and Henry, Captain Meigs drew up a modified scheme for lighting, heating and acoustics, and Dr. Walter, formerly the official architect of the Capitol, was skilful enough to conform his design with perfect success to the dispositions desired by his scientific coadjutors. How far the executed plan, which was naturally made after a thorough study of those already in existence, resembled that of Mr. Anderson, we cannot say, and, indeed, Mr. Anderson's must have been a very beautiful design, if it was in any way the prototype of Mr. Walters's, but it was sufficiently like it to make Mr. Anderson think that some of the ideas in it belonged to him, and that he ought to be paid for the use of them. Unfortunately for himself, he imagined that, when the United States got the benefit of any one's property or labor, it paid the owner for them as soon as the propriety of his claim was proved, and it was, apparently, not for some time that he discovered that our system of Government recognizes no obligation, on the part of the public authority, to pay any of its debts, and that the only way for a creditor of the nation to collect his just dues is to draw up a petition, and present it with all the other petitions, honest and dishonest, which come before every Congress, and finally, to devote his life to begging, and whining, and boring his particular petition through Congress and committees to some sort of final action. After once entering, however, the lists of supplicants for Congressional favor, it is not easy to retreat, and Mr. Anderson spent weary years in pleading, and representing, and urging his claim before it was finally reported favorably in the Senate, and a vote passed, appropriating twenty thousand dollars as compensation for his labors.

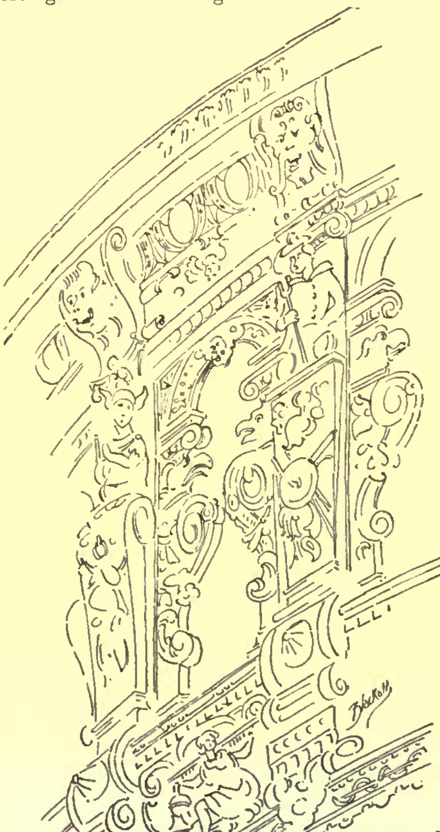
HANSEATIC ARCHITECTURE.[1] — II.



OF the Hanseatic cities properly so called, Bremen is by all odds the most richly endowed with monuments, Hamburg, as already stated, having lost nearly everything of architectural interest erected subsequently to the fifteenth century. Bremen appears to have been an intermittent adherent to the original League, having been expelled more than once for refusing to submit to the common laws; and when the final union of Bremen, Hamburg and Lubeck arose as a consequence of the dissolution of the confederation, Bremen secured a larger share of freedom and greater privileges than the other cities; at least, she certainly seems to be the more independent now. The Bremen merchants have always been wealthy and prosperous, and, naturally, the best examples of the Hanseatic style are found here. The architectural interest of the city is grouped about the market-place, in the centre of which is one of those great, rudely-carved stone giants, clad in full armor with a long sword in his hand and a weakly benign smile on his face: a figure such as is found in nearly all the Hanse towns, and, under the name of the Roland, is supposed to typify the popular liberty and the independence of the municipality. At one side of the square is the old cathedral, a brick and stone structure which was doubtless quite meaningless in original design, but fortunately one of the two towers of the façade tumbled down long ago as far as the spring of the gable, and the wealthy burghers never cared enough about religious affairs to make good the damage, so now the crumbling old mass of grayish masonry forms a rather interesting group — picturesque, certainly, if not altogether architectural. Two of the other sides of the Place are closely built up with business premises, mostly of a nondescript, stucco character, but among which are a few very noticeable examples of the style under consideration. One of these is illustrated on the sheet of sketches No. 1,[2] and two others are shown in part herewith. They are built of brick and stone, with a great many windows, a minimum of wall-surface and a maximum of ornamentation, especially about the gables which are very high and steep, while the edges are so over-loaded with horns, irregular volutes and aggressive pinnacles that the effect, though striking and interesting at first sight, is not altogether pleasing after a little sober analysis. But the buildings are not lacking in good points, nevertheless. The relation between vertical and horizontal lines is very carefully observed, and the expedient of running all courses across the entire façade without any breaks serves in a great measure to counteract the galvanic effect of the pinnacled gables. In the building shown on the sheet of sketches the intermediate supports of the third story are of wood and quite narrow at that, the outside piers only being of brick, so that nearly the whole width of the façade is taken up by the broad windows, an arrangement which generally gives a very staring appearance to a design, though such is not apparent in either of the three buildings here considered. The lower portions of each of these examples have been so changed from what may be conjectured was their original condition, that it was not considered worth while to sketch more than the upper stories.

The fourth side of the market-place is occupied by the Rathhaus. As this is, all things considered, the finest example of the style, besides being in almost perfect preservation, it may be worth while to examine it in detail. Originally, it was a Gothic structure with plain façade broken by wide, pointed windows, some of which still exist, and are shown by the sketch on the first sheet. Perhaps, also, the broad, hipped roof which now adds so much to the ensemble was an inheritance from the earlier structure, as such an arrangement is seldom met with in the Hanseatic cities, the favorite device being the high, pitched gable at each end of the building. As nearly as can be ascertained, the Rathhaus was erected in the beginning of the fifteenth century, and two hundred years later the façade was remodelled to its present condition, the change including probably the whole of the central bay and the dormers as well as the entire lower arcade; indeed, on the front, as it now stands, there are no traces whatever of the original Gothic design except the canopies and the statues between the windows of the main story, all of which are of quite early origin. It is, of course, impossible in a sketch no larger than the one given herewith to more than slightly indicate the richness of the ornamentation so lavishly spread over the façade. The spandrels of the arcade are filled with armorial bearings supported by gracefully designed figures; the frieze above has in each panel an elaborate scroll of leaf-work with dolphins and sea-horses or little cherubs playing hide-and-seek about architectural forms; while the balustrade is one maze of open-work elaboration. Nor does the ornamentation stop with the arcade. On every column, on the brackets of the cornice, along the narrow frieze of the bay, and clear up to the graceful figure crowning the central gable, carvings are applied without stint. And the work is generally of a quality which will bear a pretty critical examination. It is executed with a great deal of spirit; it is in the main quite delicate in feeling, and is throughout far in advance of anything else produced in the north of Europe during the Renaissance period. There is a color and sparkle to the design which makes it very interesting, no matter how little one may feel in sympathy with the style, and there are bits of composition about the façade which are quite up to the Francis I work of the valley of the Loire, as, for instance, the dormer-windows at either side, and the way in which the central bay is carried up to a graceful termination. Nor does the façade seem overloaded, as might be implied by the foregoing description. The masses are simple throughout, and somehow the long row of arches, the fanciful carvings, the sharply-marked columns about the centre, the quaint old Gothic figures looking down from their pedestals between the windows, and the broad, simple roof, all seem to work together into a consistent whole where the richness of parts is not obtrusive and only comes to one as an agreeable surprise after the mind has taken in the pleasing proportions and the coherent unity of the whole.

The interior of the Rathhaus is only less interesting than the exterior. The whole upper story is one vast hall, nearly one hundred and eighty feet long and forty-five feet wide, with high wood panelling, a curious stone fireplace, a few dingy portraits and other objects of municipal pride. Suspended from the rich wooden ceiling are models of several foreign ships, trophies of Bremen's commercial triumphs, among which is one clumsy brig, with high prow and poop, bearing the American flag. The Gothic windows at either end of the hall are filled with rich stained-glass windows inscribed with the legends and coats-of-arms of the old Hanseatic burgomasters, interesting to the archæologist as well as the artist. A winding staircase in richly-carved oak leads to an upper balcony, the *Güldenkammer*, corresponding with the central bay of the façade, where the dames of the Free City were wont to assemble to witness the grand pageants of the olden days. The rough sketch of a detail of the staircase given herewith will serve to illustrate the style of interior work which was most in favor at this period.



The cellars of the Rathhaus are celebrated for the wines which are stored in them, some of the casks dating back two hundred and thirty years. One of the apartments is richly decorated with Munich frescos and has painted on the vault a huge rose, emblem of the *sub rosa* secrecy imposed on the old counsellors who held their deliberations beneath it; though whether the expression came as a result of the discretion implied, or the symbol was used as the result of the saying, the pompous old custodian would not deign to say.

There are other attractions in Bremen besides the market-place. Opposite the Ansgariikirche, towards the westend of the city is the Gewerbehaus, the old guild-hall of the drapers, erected about 1619, with a façade of stone inferior in design to either of the examples previously noted, but interesting as a bit of time-stained quaintness — a well-proportioned entrance and some effective details, but with a gable run wild with extravagant horns and pinnacles. There are also a few interesting old private houses down by the river side. But beyond these Bremen has little antiquity to offer. The city has grown modern and has its park promenades, its boulevards, its fashionable hotels patronized by Americans and the nobility; and it is withal so clean and tidy, and so full of comfortable, well-built houses of recent date that one cannot feel altogether sorry the old Hanseatic work has gone. Perhaps were there more of the quaint gables and

[1] Continued from No. 532, page 116.
[2] See *American Architect* for March 6.

eccentric carvings, what there is would not be valued as truly for itself.

But if Bremen has changed its appearance and become a model city, the same cannot be said of Lubeck. Indeed, the capital of the Hanseatic League, so far as we can judge, has not materially changed its appearance since the days when its haughty citizens, single-handed, declared war against the king of Denmark, and equipped an army to make good their defence. Those were proud days for the old Free City; and, with the wealth accruing from their far-reaching commercial relations, the burghers were able to spend almost any amounts in architectural efforts. But they must have been a close-fisted race, with all their prosperity, for the monuments which have come down to us — and it is doubtful if any of importance have disappeared — are of far less artistic merit than those of Bremen. Perhaps the Lubeckers were too religious, and loved the house of God more than they did a cosey fireside or a sumptuous town-hall. At any rate, the churches represent the greatest expenditure of money, and, being among the best-existing examples of North-German brickwork, they show that the people were more in earnest, or had better ideas in such directions of architecture, than some of their neighbors; though, as the religious structures, without exception, antedate the Reformation, none of them are in the style at present under consideration. In nearly all of the churches, however, can be found a little Hanseatic work of some form or other. In the Marienkirche there is a very handsome spiral staircase leading to an upper gallery of the choir, erected somewhere about 1670, judging from the appearance of the work, which is all in richly-carved oak, with a few traces of color-decoration. The stairway is preceded by a doorway designed with considerable taste, a drawing of which is given on the second sheet of sketches. In the cathedral, also, there is an elaborate clock in the late Renaissance, set with rich carvings and with a curious dial in the shape of a big, round face, which rolls its eyes ominously with every swing of the pendulum, to the dismay of the small boys. The Rathhaus, the ancient seat of the Hanseatic Diets, is still in good trim — a stately structure of brick, dating principally from 1440, but with a handsome staircase of 1570, picturesquely-arranged on the outer street front, the most interesting portion of which is shown on the sheet of sketches. The upper-work is entirely of wood, the columns and arches only being of stone. Much of the ornamentation has been eaten away by time, and the whole has suffered a great deal, but enough remains to illustrate the idea. Farther along, on the same side of the Rathhaus, is the bay-window, shown with the sketches, also of wood, and sadly dilapidated.

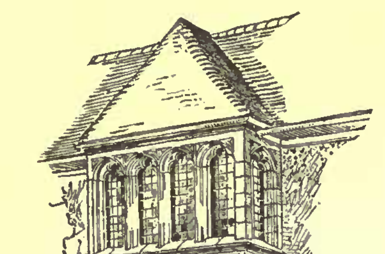
Lubeck has quite a number of smaller buildings of the later Hanseatic period, one of the best of which is the house of the *Kaufleute Compa,nie*, dating from 1585, containing council and audience rooms panelled and wainscotted in dark-toned old oak, with heavy-timbered ceilings, and rich carvings and elaborate inlays, used in a way which shows that the Lubeckers knew how to spend their money when the fancy seized them to have something really good. And in a more moderate line, there are long streets full of interesting houses dating from the sixteenth and seventeenth centuries, with high, quaintly-disposed gables, abounding in odd volutes and exclamatory obelisks and grotesque figures looking down from a niche somewhere and displaying the family-arms; roccoco pediments and attenuated columns about the windows, of a kind which would seem thoroughly bad anywhere else, but which in place have a quaint charm which is often vainly sought after in more seriously-studied work; high door-posts, covered with just such strap-work as that which the Elizabethan architects applied indiscriminately to ceiling or stair-newel, and which, in our days, sometimes becomes degenerated into an adjunct of the jig-saw style; and occasionally a broad-arched entrance-way, such as that shown on the sheet of sketches, simple in spite of the meaningless stucco-figures piled above it, and full of the sparkle and life which a judicious use of effective mouldings can give to an arch. Down by the river Trave, also, there is an interesting old wine-tavern with an elaborately-designed tap-room, in good order yet, after two centuries and a half of wear. Lubeck is chiefly interesting to the architect for its brickwork of an earlier period, but there are a great many bits of good Renaissance work scattered through the city, which will repay the task of hunting them out, and which cannot be disregarded in a consideration of the architecture of the Hanseatic League.

There are numerous examples of the style in other cities of Northwestern Germany. Brunswick was one of the firmest adherents to the League, and has several interesting structures of the sixteenth century, notably the *Gewandhaus*, near the market, a building in brick and stone, carried out over the street, rising from three stumpy columns and a series of depressed arches, and ending in a tall gable, devoid of the aggressive horns and pinnacles of the Hamburg buildings, but designed more quietly and in better taste. And Hanover has a number of examples, the best of which is the Leibnitz House, really quite good in its way, and in some details equal to the central bay of the Bremen town-hall. But, outside of the older Hanse towns, the style becomes plainly an exotic, for in nearly every instance the example will be surrounded by other houses bearing the same or a later date, though designed in an entirely different style and spirit. Berlin, itself once a member of the League, has but a single reminder of the Hanseatic influence — a little corner of the old royal palace which overlooks the Spree, the only bit of picturesque architecture in all the stiff modern city.

There are a few general features of the style which naturally suggest themselves to any one making even the most superficial study thereof. One noticeable point is the entire absence of chimneys as features of the general design, a marked contrast to the manner in which the English and French architects of the same period so gracefully utilized these most important factors of a modern house. Nowhere in any of the Hanse towns does the chimney make its appearance as an ornamental feature, and even in the Bremen town-hall, which contains a large fire place, the chimney is led up at the rear and concealed behind the big roof. Again, it is interesting to note how stone is considered essential to every design, brick being merely a filling. Doubtless the Hanse architects knew better than to attempt the fine detail characteristic of the style in so clumsy a medium as brick, and hence, when it was impossible to obtain the better material, they used stucco, as was sometimes the case at Lubeck, though the rareness of such usage shows a decided reluctance to employ so cheap a substitute. The round arch is not often met with in the old work. The depressed arch, accommodating itself to different spans with the same rise, was the favorite form, and was generally used without mouldings of any sort — a flush arch in brick, with stone-springing and key-blocks. In the carved ornamentation which was so lavishly applied, the human figure plays a prominent part, but rarely on a large scale, always as an accessory to a panel, or as a terminal piece, too small to count as anything more than a finial that is to say, isolated statues were seldom used, the figures on the Bremen Rathhaus belonging to an earlier period, as previously stated. In one respect the buildings of this period never failed: they were always picturesque, and were pleasing to the eye in summer or winter, depending on themselves for charms of this kind, and being quite independent of accidental conditions of season or surroundings. They were harmonious in tone too, nearly always avoiding the staring, obtrusive qualities, which somehow, seem almost inseparable from modern combinations of bright-red brick and light-colored sandstone. And the designs, as a rule, finished well; the gables were satisfactory, not in their details, perhaps, nor in the fantastic outlines in which the old builders delighted to indulge their fancy, but in the general manner the design was built up from the broad wall-space or the crowded range of windows below, to the easily-managed finial pinnacle. There is no indecision about the idea, however fussy some fragments of the execution may appear; and, while no one would claim for the Hanseatic architecture any more than it is worth, or put it on an equality with what the same period produced in France, it was an honest attempt, and cannot be despised, especially in this busy period of the nineteenth century, when the tendency of architecture is to be omniverous in selection, striving to draw the good from all styles. The architectural attempt has got to be pretty bad which has not some good points about it, and, in any case, we who are called on to use brick and stone so extensively can surely draw some suggestions of practical value from the old Hanse architecture.

C. H. Blackall.

THE PRINCIPLES OF DOMESTIC FIREPLACE CONSTRUCTION.



Bay Window in Cloister. St Cross. Winchester Eng.

THIS was the subject of the Friday evening discourse at the Royal Institution on February 5th, the lecturer being Mr. T. Pridgin Teale, M.A., F.R.C.S., who is already known to most of our readers as an investigator in this important field of applied science, and as a writer on sanitary subjects.

Mr. T. Pridgin Teale, at the outset referred to the appropriateness of the use of the lecture-theatre of the Royal Institution for a lecture on this subject, seeing that Count Rumford, the founder of the Institution, devoted a great deal of attention to the study of the subject, which was particularly referred to in the prospectus of the Institution as "a very important part of the useful information to be conveyed in the public lectures of the Royal Institution." Correct principles, said the lecturer, have been habitually, and, until the last few years, almost universally, violated, and the rules so ably worked out, so earnestly and forcibly advocated by Rumford, have lain dormant, lingering here and there, chiefly in old-fashioned houses, and almost forgotten. Three evils result from the prevalence of bad principles in construction: 1. Waste of fuel and

loss of heat. 2. Excessive production of soot and smoke. 3. Large addition to ash-pit refuse by cinders, which are really unburned, and therefore wasted, fuel. These are matters of national concern, and it has been the main object of my labors on this question during the last four years to endeavor to convince the public that it is the interest no less than the duty of every householder, to burn his fuel on correct principles, and to do his part towards the diminution of these evils. Heat is wasted in three ways — either by combustion under the impulse of strong draught, which means rapid escape of heat up the chimney; or by imperfect combustion of the gases which are generated during the burning of the coals; or by escape of heat through the iron sides and back into the space between the range and the brickwork and its top into the chimney. The greatest offenders are the ordinary register grates. Iron all over, back, and sides, and roof, they are usually set in a chamber open above to the chimney, and imperfectly filled in, or not filled in at all, with brickwork. The heat escapes through the iron to this chamber, and thence is lost. Another fault is that the "register opening," in other words the "throat of the chimney," being immediately above the coal, submits the burning fuel to the full concentrated force of the current to the chimney, converting the fire into a miniature blast-furnace.

The second result of faulty construction in fireplaces is "undue production of smoke and soot." Smoke and soot imply imperfect combustion, and to this two defects in a fire mainly contribute — one, too rapid a draught through the fire which hurries away and chills below burning point the gas rising from the heated fuel. The other defect is too cold a fire, *i.e.*, too small a body of heat in and around the fuel, so that the temperature of the gases is not raised to a point at which they will burn.

A few years ago the prevalence of unusually dense fogs roused the metropolitan public to a sense of this great evil. The Smoke Abatement Society was formed, and under its auspices exhibitions of smoke-consuming apparatus and improved fireplaces were held in London and Manchester. Beyond the fact that certain grates were pronounced to be good in point of economy, and moderate in the production of smoke, and that the public has been led to take an interest in and inquire into the relative value and economy of various patent fireplaces, there has been but little advance in the education of the public in the principles which lie at the root of the whole question.

A third result of bad construction is the "production of cinders." With good coal, cinders are inexcusable. They are unconsumed carbon — coke — and imply a faulty fireplace. If thrown into the ash-pit, as is the case in ninety-nine times out of one hundred, they are shameful waste, and more than waste, for they entail a great cost for their removal. The town of Leeds pays about £14,000 a year for the scavenging of the streets and the emptying of ash-pits. Nearly every house in Leeds supplies, in the way of cinders, at least twice as much ash-pit refuse as it might do were the fireplaces properly constructed. The ash-pit refuse of Leeds is burned in a "destructor," and the cinders in the refuse provide not only heat enough for its reduction to a mineral residue, but spare heat for driving two sixty-horse-power engines, and for consuming a reasonable amount of pigs, etc., killed by, or on account of disease.

These three great evils, evils affecting not only individuals, but the community, waste of fuel and heat, production of soot, production of cinders, are a direct result of the violation of the correct principles in fireplace construction.

Let us next inquire what are the principles which promote good combustion in an open fireplace — *i. e.*, what are the conditions which are essential to enable fuel to give out to a room "good money's worth in heat." That such a result may be obtained fuel must burn *well*, but *not rapidly*. Two things in combination are essential to the combustion of fuel — a supply of oxygen and a high temperature — *i. e.*, plenty of heat around the fuel. If fuel be burned with a hot jacket around it, a very moderate amount of oxygen will sustain combustion, and if the supply of oxygen be moderate, combustion is slow. Burn coal with a chilling jacket around it, a rapid conductor like iron, and it needs a fierce draught of oxygen to sustain combustion, which means rapid escape of actual heat, and also of potential heat in unburned gases and smoke, up the chimney. This is the key to the whole position; this is the touchstone by which to test the principles of fireplace construction.

Few people probably realize the exact conditions of combustion, which may be well illustrated from the process of manufacture of coal gas.

In the manufacture of gas, coal is raised to a high temperature, and the gasses are driven off by roasting the coal in an oven from which air, *i. e.*, oxygen is shut out. The gasses are conducted away, cooled, purified, and stored for future use in a gasometer; the combined carbon and mineral residue, being non-volatile, is cooled down before being exposed to the air, and is sold as coke. Here we have a striking proof that high temperature in fuel does not of itself imply combustion. If air were admitted to the red-hot coke, or to the gases as they escape in their heated condition from the furnace, they would burn. But when coke has become cold, and the gases are cold, as in a gasometer, no amount of oxygen will of itself start combustion. The deduction from all this is, that complete oxydation, *i. e.*, good combustion, is possible only when the fuel and gases are at a high temperature, and that high temperature of fuel does not produce combustion until oxygen is introduced; therefore we can have a high temperature of fuel without rapid combustion, provided we control and limit the supply of oxygen. My attention was first directed to the question of waste of fuel at the time of the coal famine some twelve years ago. I read in the *Times*, and acted upon the suggestion made, I believe, by the late Mr. Mechi, to economize coal by inserting an iron plate on the grid under the fuel so as to cut off all draught through the fire. This undoubtedly induced slow combustion, and economized fuel, but the fire was dull, cold and ineffective. The plan was abandoned. It taught me, however, the fact that combustion could be controlled by cutting off the under-draught, but I did not then see why combustion was spoiled. The reason was that the under-surface of the fire was chilled, and the fuel lost its incandescence owing to the rapid loss of heat through the iron towards the open hearth chamber. To some persons even now "slow-combustion stoves" are an abomination, and are supposed to be synonymous with bad combustion. The next stage in my fireplace education was the adoption of the Abbotsford grate. I thereby learned that the reason why an Abbotsford grate was an advance upon the iron plate lay in the fact that the solid fire-brick bottom stored up heat, and enabled the fuel to burn more brightly resting upon a hot surface — not upon a cooling iron plate. But Abbotsford grates, and the other class of grates with solid fire-brick bottoms, the "parson's" grates have disadvantages. They are apt to become dull and untidy towards the end of the day, and do not burn satisfactorily with inferior coal. There is a better thing than a solid fire-brick bottom, and that is the chamber under the fire closed in front by an "economiser." Some five years ago I made, somewhat accidentally, the discovery that the burning of coal in an ordinary fireplace could be controlled and retarded by the adoption of a very simple and inexpensive contrivance, applicable to nearly every existing grate, and that this result could be attained without impairment of, and often with increase of, the heating power of the fire. This contrivance, which I have named an "Economiser," was simply a shield of iron standing on the hearth, and rising as high as the level of the grid at the bottom of the grate, converting the hearth space under the fire into a chamber closed by a movable door. The effect was twofold. The stream of air, which usually rushes through the bottom of the fire, and causes for a short time rapid combustion at a white heat, was thereby cut off, and the air under the fire was kept stagnant, the heated coal being dependent for its combustion on the air passing over the front and the upper surface. The second point was that this boxing up rendered the chamber hotter, and this increased temperature beneath the fire-grate, *i. e.*, under the fuel, added so materially to the temperature of the whole, even of the cinders coming into contact with the iron grid, that the very moderate supply of oxygen reaching the front and upper surface of the fuel was sufficient to maintain every portion in a state of incandescence. Moreover, I observed that combustion was going on at an orange, not at white, heat. Let us contrast a white with the orange heat: A white heat in a fire means rapid combustion, owing to the strong current of air, oxygen, which passes under the grate, through the centre of the fire, and up the chimney. As soon as the heart of the fire has been rapidly burned away at a white heat, the fuel cools; the iron grid cools also; and the cinders in contact with the grid are chilled below combustion point. They then cease to burn, and the bottom of the fire becomes dead and choked. The poker must now be brought into play to clear away the dead cinders, and to re-open the slits in the chocked grid. New coal is added to the feeble remnant of burning embers, with no reserve of heat in the iron surroundings; and in time, and perhaps very slowly, the fire revives, and rapid combustion sets in afresh under the influence of the renewed current of oxygen passing through the heart of the fire. An orange heat means that the coke, *i. e.*, the incandescent cinder, is burning with a slowly applied stream of oxygen, a degree of combustion which is only possible when the coal is kept warm by the hot chamber beneath, and by a reasonable limitation of loss of heat at the back and sides by fire-brick, either in contact with the fuel, or, at least, close behind the iron surrounding it. This effect is seen, partially, in the grates with solid fire-brick bottom, but far more perfectly in the grates with the chamber closed by the "Economiser."

This hot chamber has the following effects: The incandescent coal remains red hot from end to end of the grate until nearly all is consumed, thus maintaining a larger body of the fuel in a state to radiate effective heat into a room. The cinders, on coming into contact with the iron grid remain red hot, and so continue to burn away until they fall through the grid as a fine powder. This allows the fire to burn clearly all day long almost without poking. When the fire is low, and new coal is added, the reserve of heat in the hot chamber is such that the addition of cold fresh fuel does not temporarily quench the embers, and the fire is very quickly in a blaze after being mended.

Having made the discovery by the observation of a grate supplied to me with an "Economiser," the value of which, I suspect, was hardly appreciated by the makers, I applied "Economisers" one by one to all my grates, kitchen included. The result surpassed my expectations. There was a saving of at least a fourth of my coal. The experience of many friends, who at my advice adopted the system, confirmed my own results. It was, therefore, clear to me that I was bound to make widely known a discovery which was fraught with such benefit to myself, and was likely to prove a great boon to the public. My chief aim hitherto has been to persuade the public to apply the "Economiser" to existing fireplaces. After steady exertions for four years, some impression has been made on the iner-

tia of the public, and extensive trials of the "Economiser" are taking place in many parts of the country. To-day, however, my aims are more complete. It is my wish to advocate not one principle alone, although that is the cardinal one, but to urge all the best principles which enter into the construction of a really effective fireplace, and to induce those whom it may concern to replace bad by an entirely new construction, right in every point. The rules of construction which I shall lay down have been arrived at entirely by my own observation of what appeared to be the best point in various fireplaces. It was, therefore, no less a satisfaction to me than a surprise to discover, on reading Rumford's work in preparation for this lecture, that nothing which I have to advocate is new, but that every principle, and the "Economiser" is hardly an exception, was advocated no less enthusiastically by him at the very commencement of this century.

1. "As little iron as possible." The only parts of a fireplace that are necessarily made of iron are the grid on which the coal rests, and the bars in front. The "Economiser," though usually made of iron, from convenience in construction, might be of earthenware, and so would be more perfectly in harmony with this rule.

2. "The back and sides of the fireplace should be of brick, or fire-brick." Brick retains, stores, and accumulates heat, and radiates it back into the room, and keeps the fuel hot. Iron lets heat slip through it up the chimney, gives very little back to the room, and chills the fuel.

3. "The fire-brick back should lean over the fire, not lean away from it," as has been the favorite construction throughout the kingdom. The lean over not only increases the power of absorbing heat from rising flame—otherwise lost up the chimney—but the increased temperature accumulated in the fire-back raises the temperature of gases to combustion point, which would otherwise pass up the chimney unconsumed, and thus be lost. Rumford discovered accidentally the value of this "lean-over," and at once realized its immense importance. He does not, however, seem to have carried out his intention of working out for general adoption this form of back. Of recent years "lean-over" backs have been reinvented and sparingly used. The "Milner" back, invented by a Lincolnshire clergyman, and adopted by Barton & Co., is excellent. It burns fuel well and gives out a great heat. But it is extravagant in consumption unless controlled by the "Economiser." Captain Douglas Galton saw the virtue of the "lean-over," and adopted it in the grate which goes by his name. The "Bee-hive" back was the same in principle and very good, and, having a very small grid, was economical. The "Rifle" back, adopted by Nelson & Sons, of Leeds, gives an admirable fire, little short of perfection; but observation shows that the "tall" flame extends far beyond the bend, and is, therefore, soon lost as a heating factor, the heat being wasted in the chimney.

4. "The bottom of the fire, or grating, should be deep from before backwards, probably not less than nine inches for a small room, nor more than eleven inches for a large room." This is a corrollary to Rule 3. We cannot possibly have the back of the fireplace overhanging the fire when there is a shallow grid. If for no other reason than the demands of the "lean-over," depth of fire space is essential. But there is gain, thereby in another direction. It affords plenty of room for the burning fuel to lie down close to the grid, and away from swift air-currents, and prevents the tendency of the fire to burn hollow.

5. "The sides or 'covings' of the fireplace should be inclined to one another like the sides of an equilateral triangle." The working out of this rule has cost me much thought and experiment. It was worked out more or less empirically with a view to attain certain objects, and, having attained them, I discovered that I had unwittingly selected the sides of an equilateral triangle. It is of some importance, and may be of interest, to tell how the question arose. In my earlier fireplaces the sides or "covings" were parallel to each other, and had the defect that they radiated most of their heat from one to the other, not into the room, with the probable result that much of such heat would eventually escape up the chimney. It was clear then that the sides must be set at an angle with the back, so as to face towards the room. But at what angle? My first experiments were determined by the shape of the corner bricks which were in the market. These determined the inclination of the sides to be such that, if prolonged, they would meet at a right angle. This is the angle laid down by Rumford as the angle of selection, but as the largest angle admissible in a good fireplace. This angle, however, brought me into difficulties with my "lean over" back. The openness of the angle made the back, as it ascended, spread out so rapidly that what was gained in width was lost in height. Moreover, my critics objected to its appearance as ugly. What then should determine the inclination of the sides? The point was thus determined. Seeing that a heated brick throws off the greatest amount of radiant heat at a right angle with its surface, the "covings" should at be such an inclination to each other that the perpendicular line from the inner margin of one "coving" should just miss the outer margin of the opposite "coving." Where the "covings," as in my earlier attempts and in Count Rumford's fireplaces, are at a right angle to each other, this perpendicular line misses the opposite margin by several inches. It was clear, therefore, that the inclination might be made more acute. Guided by this idea, and having determined the principle on which the shape of the grate should depend, an inclination was arrived at which turned out to be an angle of sixty degrees, *i. e.*, the inclination of the sides of an equilateral triangle.

6. "The 'lean over' at the back should be at an angle of seventy degrees." Commencing at the level of the top of the front bars, it should extend almost to the throat of the chimney, which, as a rule, will be about twenty-eight inches from the hearth, or sixteen inches from the top of the fire, and should extend so far forwards that the angle where it recedes towards the chimney should be vertically over the insertion of the cheeks of the fire-grate. This will be from three and one-half to four and one-half inches from the front of the fireplace, according to the size of the grate.

7. "The shape of the grate should be based upon a square described within an equilateral triangle, and the size to vary in constant proportion to the side of the square." For a moderate room, eight inches determines a very useful size; for larger rooms, nine inches, ten inches, or even eleven inches may be necessary. An area of grating of one hundred inches in the square of the corners would give a grate fireplace large enough for a room twenty feet by twenty-five feet. This rule secures sufficient depth from front to back, and a constant proportion between depth and width, whatever be the size of grate. Whenever a grate proves too large for a room, and in summer, when a smaller fire is needed, the size should be reduced in width by firebrick, the fuel depth being retained.

8. "The slits in the grating, or grid, should be narrow, perhaps one-quarter of an inch for a sitting-room grate and good coal, three-eighths of an inch for a kitchen grate and bad coal." When the slits are larger small cinders fall through and are wasted.

9. "The front bars should be vertical, that ashes may not lodge and look untidy; narrow, perhaps one-quarter of an inch in thickness, so as not to obstruct heat; and close together, perhaps one inch apart, so as to prevent coal and cinder from falling on the hearth."

10. "There should be a rim one inch or one and one-half inch in depth round the lower insertion of the vertical bars." The object of this is to conceal the ash at the bottom of the fire, and to enable the front cinders to burn away completely by protecting them from the cold air. The rim contributes greatly to tidiness, and, as a rule, will prevent the need of any sweeping up the hearth during the day.

11. "The chamber under the fire should be closed by a shield or 'Economiser.'" This has been already spoken of, and described as the central principle which enhances greatly the value of all the rest.

12. "Whenever a fireplace is constructed on these principles, it must be borne in mind that a greater body of heat is accumulated about the hearth than in ordinary fireplaces. If there be the least doubt whether wooden beams may possibly run under the hearth-stone, then an ash-pan should be added, with a double bottom, the space between the two plates being filled with artificial asbestos, 'slagwood,' one and one-half inch in thickness."

13. "A fireplace on this construction must not be put in a party-wall where there is no projecting chimney-breast, lest the heated back should endanger woodwork in a room at the other side."

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

"SEA VERGE." THE DINING-ROOM. MONMOUTH BEACH, N. J. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

THIS room in the house of George F. Baker, Esquire, is finished in redwood. The house itself is built of brick with Carlyle stone for finish and Akron tiles for the roof. Oak is used for inside finish in most of the rooms.

OLD COLONIAL WORK, NOS. IV AND V. GATE-POSTS, SALEM, MASS. MEASURED AND DRAWN BY MR. F. E. WALLIS, BOSTON, MASS.

HANSEATIC ARCHITECTURE, II. SKETCHED BY MR. C. H. BLACKALL.

For description, see article elsewhere in this issue.

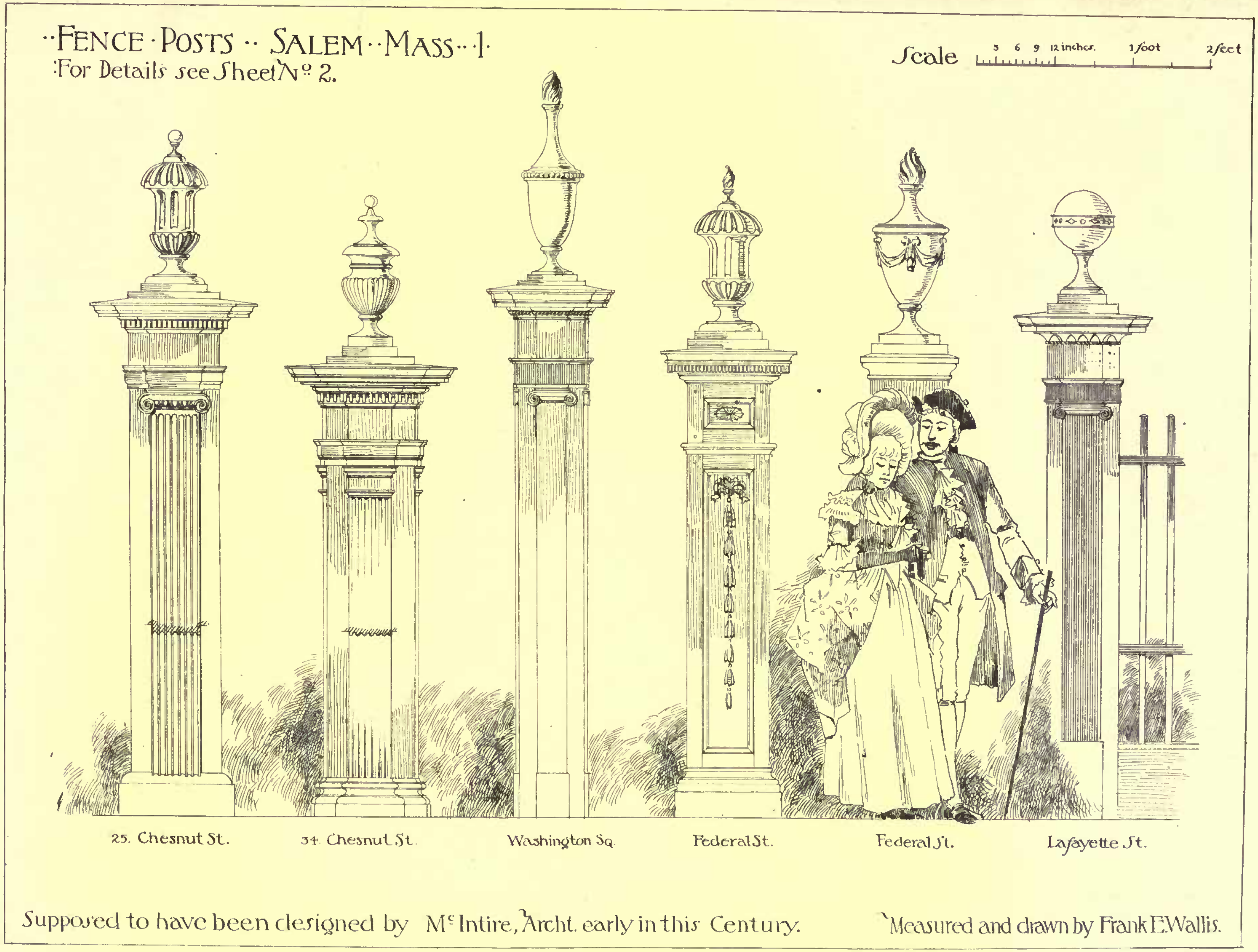
CHURCH OF THE MESSIAH, BROOKLYN, N. Y. MR. R. H. ROBERTSON, ARCHITECT, NEW YORK, N. Y.

DETAILS OF THE SAME.

Architectural Students who desire to take part in the third annual examination for the Rotch Travelling Scholarship are requested to present themselves at the Museum of Fine Arts, Boston, at nine o'clock on Saturday, April 3.

Discoveries of Statues in the Acropolis, Athens.—A few days ago, in the course of some excavations at the Acropolis, Athens, near the Erectheum, three statues of women, in an excellent state of preservation, half as large again as life, with large heads, and completely colored, were discovered. They belong to the period before Phidias, are delicately finished, and are of an archaic art, admirably preserved.—*Philadelphia Press.*

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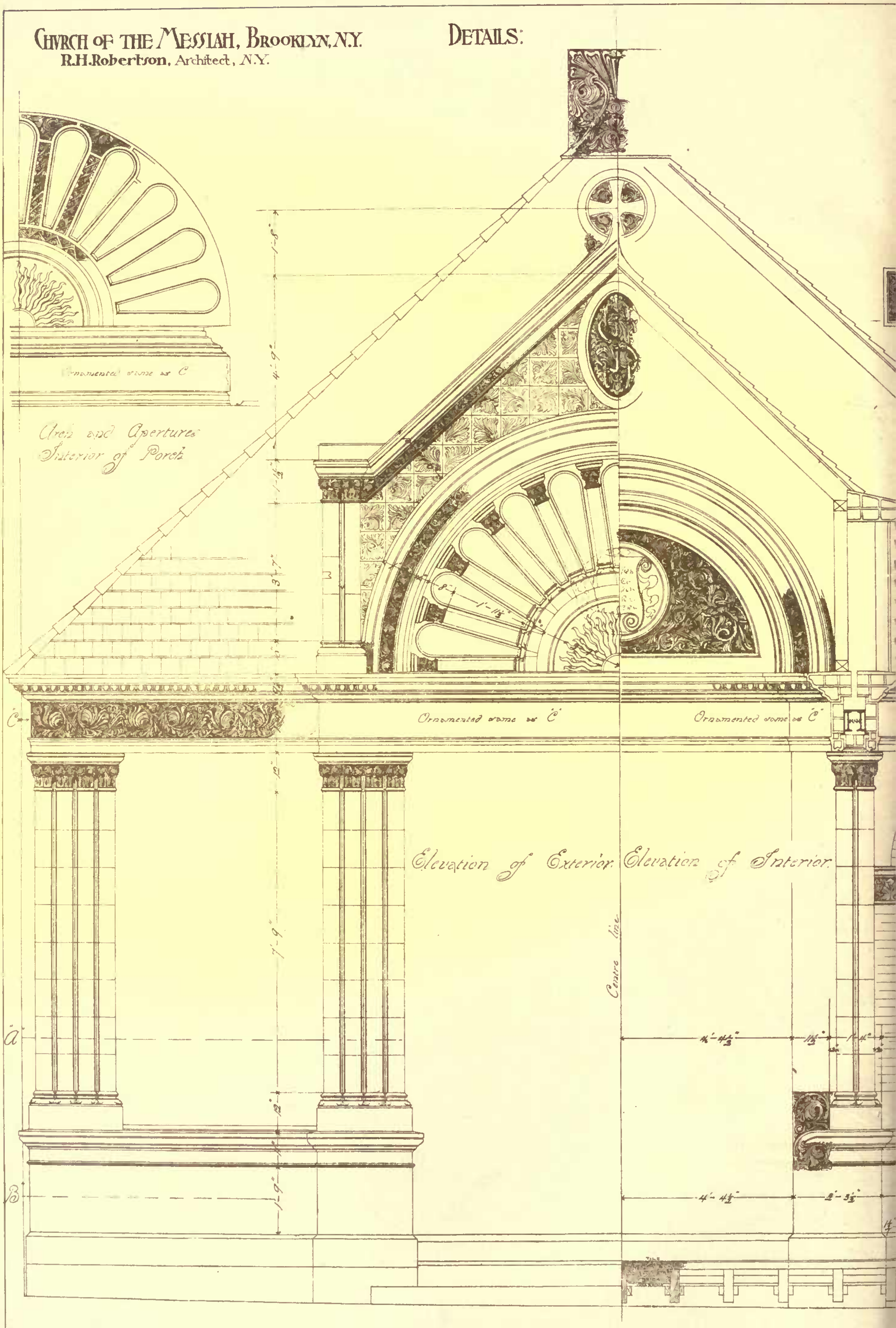
OLD COLONIAL WORK, IV.

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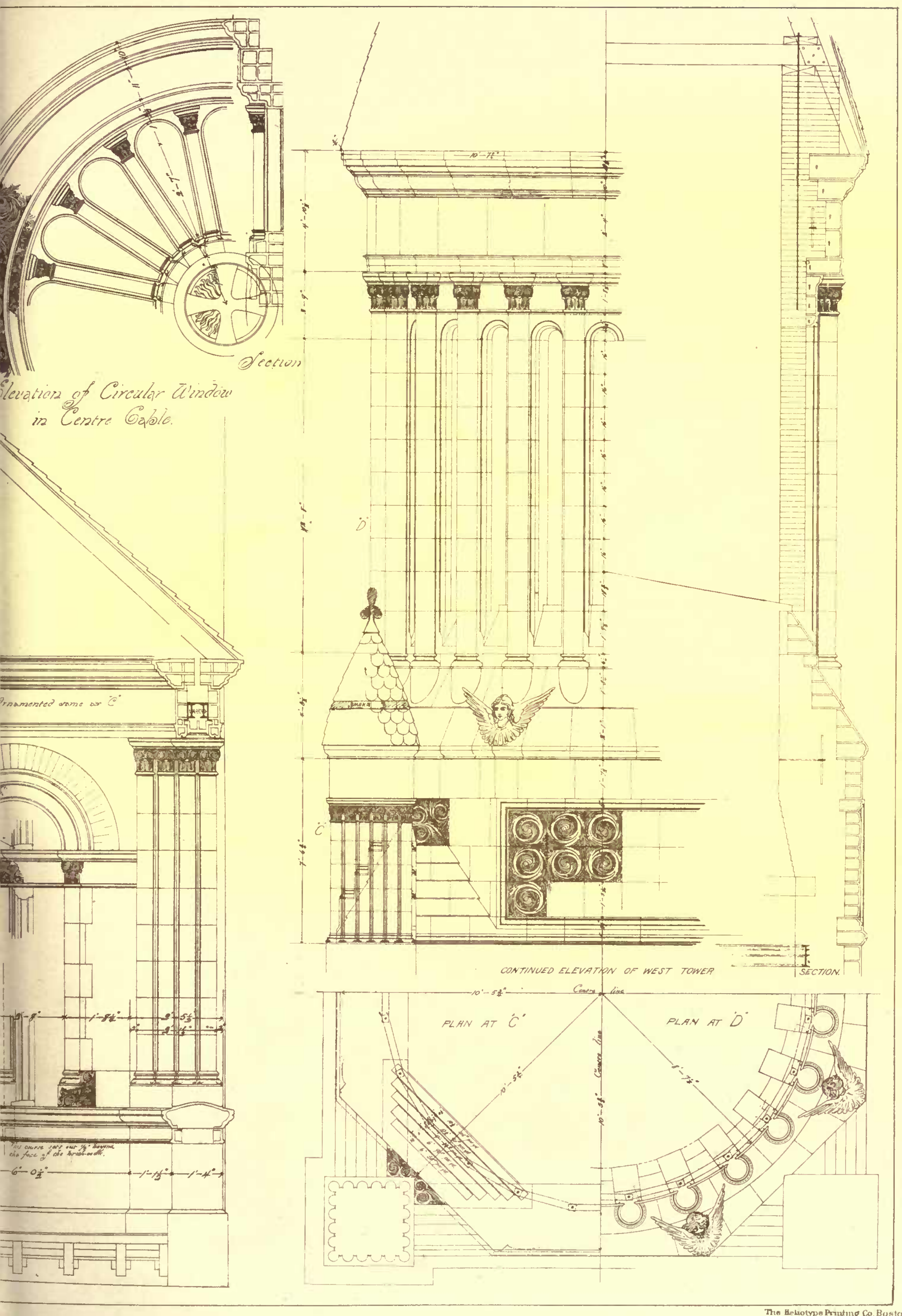


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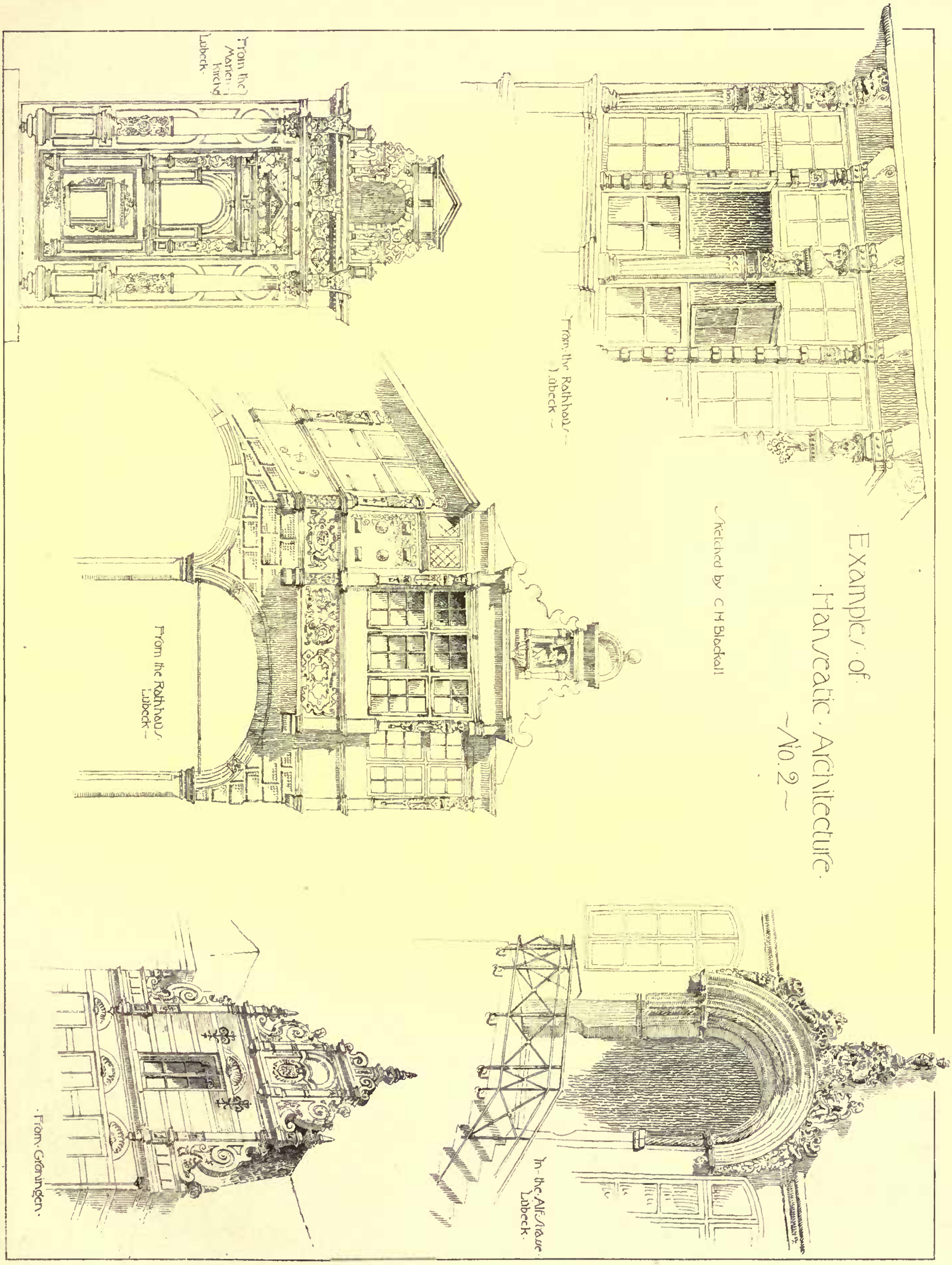

CHURCH OF THE MESSIAH, BROOKLYN, N.Y.
R.H. Robertson, Architect, N.Y.
DETAILS:
Ornamented same as C
Arch and Apertures Interior of Porch
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Ornamented same as C
Elevation of Exterior.
Elevation of Interior.
Centre line

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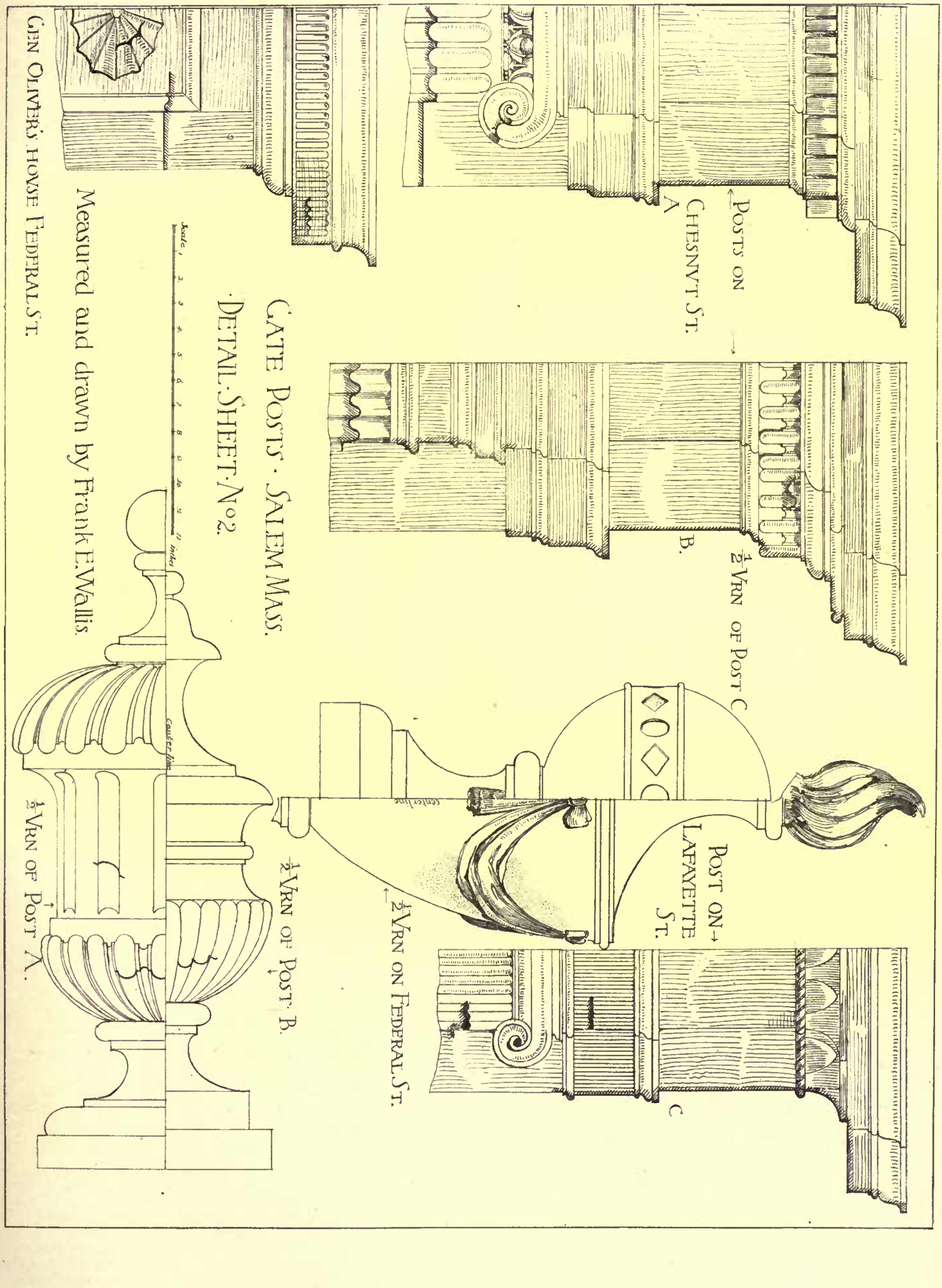
The Heliotype Printing Co. Boston.

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OLD COLONIAL WORK, V.

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SAFE BUILDING.[1]— II.



MOMENT OF INERTIA.

(German, *Trägheitsmoment;* French, *Moment d'énertie*, or *Moment de giration.*)

THE moment of inertia, sometimes called the moment of gyration; is the formula representing the inactivity (or state of rest) of any body rotating around any axis. The reason of the connection of this formula with the calculation of strains and the manner of obtaining it cannot be gone into here, as it would be quite beyond the scope of these articles. The moment of inertia of any body or figure is the *sum* of the products of each particle of the body or figure multiplied by the *square* of its distance from the axis around which the body or figure is rotating.

A table of moments of inertia, of various sections, will be given later on and will be all the student will need for practical purposes.

THE CENTRE OF GYRATION AND RADIUS OF GYRATION.

(German, *Trägheitsmittelpunkt;* French *Centre de giration.*)

The centre of gyration "is that point at which, if the whole mass of a body rotating around an axis or point of suspension were collected, a given force applied would produce the same angular velocity as it would if applied at the same point to the body itself." The distance of this centre of gyration from the axis of rotation is called the *radius of gyration* (German, *Trägheitshalbmesser;* French, *Rayon de giration*); this latter is used in the calculation of strains, and is found by dividing the moment of inertia of the body by the area or mass of the body, and extracting the square root of the quotient, or

$$\rho=\sqrt{\frac{i}{a}}, \text{ or}$$

$$\rho^2=\frac{i}{a}.$$

A table will be given, later on, of the "squares of the radius of gyration" (German, *Guadrat des Trägheitshalbmessers;* French, *Carré du rayon de giration*).

THE MOMENT OF RESISTANCE.

(German, *Widerstandsmoment;* French, *Moment de résistance*).

The moment of resistance of *any* fibre of a body, revolving around an axis, is equal to the moment of inertia of the whole body, divided by the distance of said fibre from the (neutral) axis, around which the body is revolving.

A table of moments of resistance will be given later on.

MODULUS OF ELASTICITY.

(German, *Elasticitäts modulus;* French, *Module d'élasticité*).

The modulus of elasticity of a given material is the force required to elongate a piece of the material (whose area of cross-section is equal to one square inch) through space a distance equal to its primary length. Thus, if a bar of iron, twelve inches long, and of one square inch area of cross-section, could be made so elastic as to stretch to twice its length, the force required to stretch it until it were twenty-four inches long would be its modulus of elasticity in weight per square inch.

MODULUS OF RUPTURE.

(German, *Brechungscoefficient;* French, *Module de rupture.*)

It has been found by actual tests that though the different fibres of materials under transverse strains are either in compression or tension, the ultimate resistance of the "extreme fibres" neither entirely agrees with their ultimate resistance to compression or tension. Attempts have been made to account for this in many different ways; but the fact remains. It is usual, therefore, where the cross-section of the material is uniform above and below the neutral axis, to use a constant derived from actual tests of each material, and this constant (which should always be applied to the "extreme fibres," *i. e.*, those along upper or lower edge) is called the modulus of rupture, and is usually expressed in pounds per square inch.

TO FIND THE MOMENT OF INERTIA OF ANY CROSS-SECTION.

Divide the cross-section into simple parts, and find the moment of inertia of each simple part around its own neutral axis (parallel to main neutral axis); then, if we call the moment of inertia of the whole cross-section i, and that of each part $i_{,}$, $i_{,,}$, $i_{,,,}$, $i_{,,,,}$ etc., and, further, if we call the area of each part $a_{,}$, $a_{,,}$, $a_{,,,}$, $a_{,,,,}$ etc., and the distance of the centre of gravity of each part from the centre of gravity of the whole cross-section, $d_{,}$, $d_{,,}$, $d_{,,,}$, $d_{,,,,}$ etc., we have: —

$$i=(d_{,}^2a_{,}+i_{,})+(d_{,,}^2a_{,,}+i_{,,})+(d_{,,,}^2a_{,,,}+i_{,,,})+(d_{,,,,}^2a_{,,,,}+i_{,,,,})+, \text{ etc.}$$

[1] Continued from page 112, No. 532.
[2] See Glossary of Symbols on page 167.

TABLE I.[2]

DISTANCE OF EXTREME FIBRES, MOMENTS OF INERTIA, AND RESISTANCE, SQUARE OF RADIUS OF GYRATION, AND AREAS OF DIFFERENT SHAPES OF CROSS-SECTIONS.

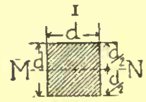
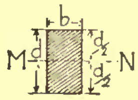
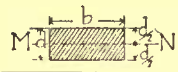
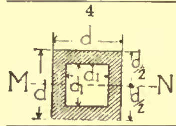
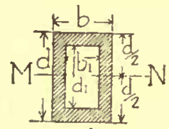
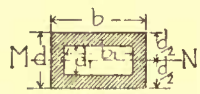
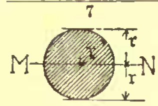
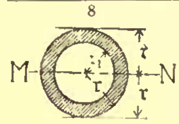
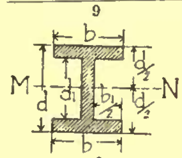
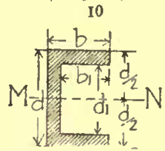
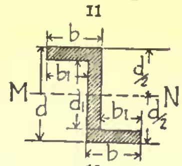
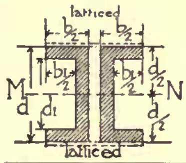
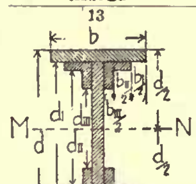
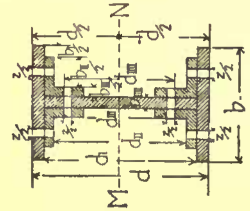
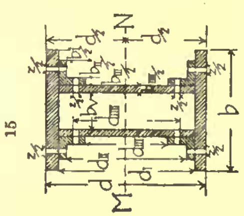
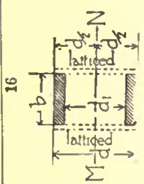
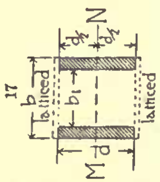
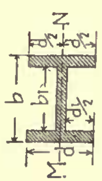
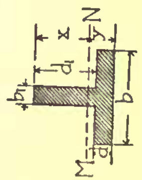
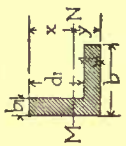
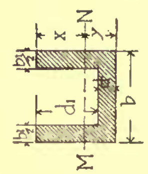
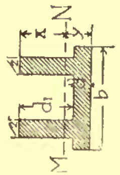
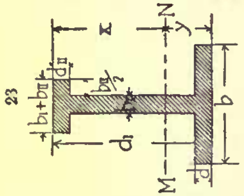
Number and Form of Section.	Distance of Neutral axis M.....N from extreme fibres.	Moment of Inertia i.	Moment of Resistance. r	Area. a.	Square of Radius of Gyration. ρ^2
1 	$\frac{d}{2}$	$\frac{d^4}{12}$	$\frac{d^3}{6}$	d^2	$\frac{d^2}{12}$
2  3 	$\frac{d}{2}$	$\frac{bd^3}{12}$	$\frac{bd^2}{6}$	bd	$\frac{d^2}{12}$
4 	$\frac{d}{2}$	$\frac{d^4-d_{,}^4}{12}$	$\frac{d^4-d_{,}^4}{6d}$	$d^2-d_{,}^2$	$\frac{d^2+d_{,}^2}{12}$
5  6 	$\frac{d}{2}$	$\frac{bd^3-b_{,}d_{,}^3}{12}$	$\frac{bd^3-b_{,}d_{,}^3}{6d}$	$bd-b_{,}d_{,}$	$\frac{bd^3-b_{,}d_{,}^3}{12(bd-b_{,}d_{,})}$
7 	r	$\frac{11}{14}r^4$	$\frac{11}{14}r^3$	$\frac{22}{7}r^2$	$\frac{r^2}{4}$
8 	r	$\frac{11}{14}(r^4-r_{,}^4)$	$\frac{11}{14}\frac{(r^4-r_{,}^4)}{r}$	$\frac{22}{7}(r^2-r_{,}^2)$	$\frac{r^2+r_{,}^2}{4}$
9  10  11  12 	$\frac{d}{2}$	$\frac{bd^3-b_{,}d_{,}^3}{12}$	$\frac{bd^3-b_{,}d_{,}^3}{6d}$	$bd-b_{,}d_{,}$	$\frac{bd^3-b_{,}d_{,}^3}{12(bd-b_{,}d_{,})}$
13 	$\frac{d}{2}$	$\frac{1}{12}(bd^3-b_{,}d_{,}^3-b_{,,}d_{,,}^3-b_{,,,}d_{,,,}^3)$	$\frac{bd^3-b_{,}d_{,}^3-b_{,,}d_{,,}^3-b_{,,,}d_{,,,}^3}{6d}$	$bd-b_{,}d_{,}-b_{,,}d_{,,}-b_{,,,}d_{,,,}$	$\frac{1}{12}\cdot\frac{bd^3-b_{,}d_{,}^3-b_{,,}d_{,,}^3-b_{,,,}d_{,,,}^3}{bd-b_{,}d_{,}-b_{,,}d_{,,}-b_{,,,}d_{,,,}}$

TABLE I.[1] (*Continued.*)

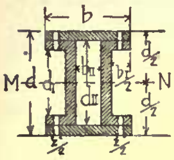
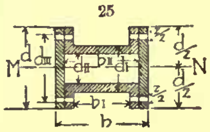
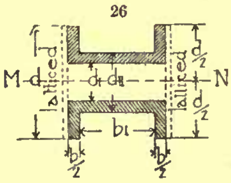
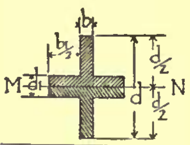
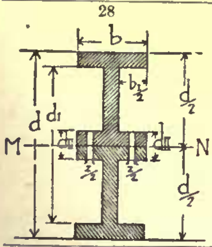
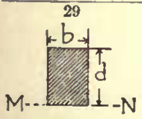
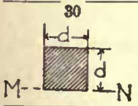
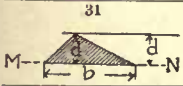
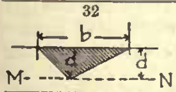
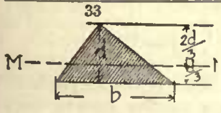
DISTANCE OF EXTREME FIBRES, MOMENTS OF INERTIA AND RESISTANCE, SQUARE OF RADIUS OF GYRATION, AND AREA OF DIFFERENT SHAPES OF CROSS-SECTIONS.

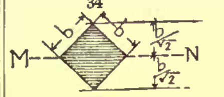
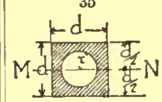
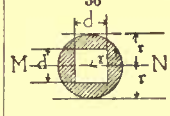
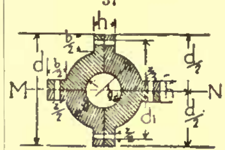
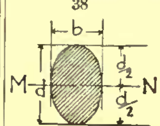
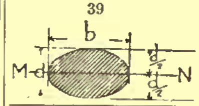
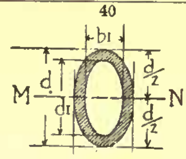
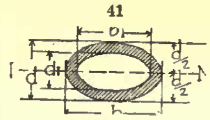
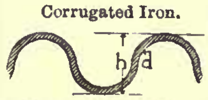
Number and Form of Section.	Distance of Neutral axis M......N from extreme fibres.	Moment of Inertia i.	Moment of Resistance. r.	Area. a.	Square of Radius of Gyration. ρ^2
14 	$\frac{d}{2}$	$\frac{1}{12}\left\{(b-z)d^3-b_{\mathrm{I}}d_{\mathrm{I}}^3-(b_{\mathrm{II}}-z)d_{\mathrm{II}}^3-b_{\mathrm{III}}d_{\mathrm{III}}^3-(b_{\mathrm{III}}+b_{\mathrm{IIII}})(d_{\mathrm{IIII}}^3-(d_{\mathrm{IIII}}-z)^3)\right\}$	$\frac{(b-z)d^3-b_{\mathrm{I}}d_{\mathrm{I}}^3-(b_{\mathrm{II}}-z)d_{\mathrm{II}}^3-b_{\mathrm{III}}-d_{\mathrm{III}}^3-(b_{\mathrm{III}}+b_{\mathrm{IIII}})(d_{\mathrm{IIII}}^3-(d_{\mathrm{IIII}}-z)^3)}{6d}$	$bd-b_{\mathrm{I}}d_{\mathrm{I}}-b_{\mathrm{II}}d_{\mathrm{II}}-b_{\mathrm{III}}d_{\mathrm{III}}-z(d-d_{\mathrm{II}})-z(b_{\mathrm{III}}+b_{\mathrm{IIII}})$	$\frac{(b-z)d^3-b_{\mathrm{I}}d_{\mathrm{I}}^3-(b_{\mathrm{II}}-z)d_{\mathrm{II}}^3-b_{\mathrm{III}}d_{\mathrm{III}}^3-(b_{\mathrm{III}}+b_{\mathrm{IIII}})(d_{\mathrm{IIII}}^3-(d_{\mathrm{IIII}}-z)^3)}{12\left\{bd-b_{\mathrm{I}}d_{\mathrm{I}}-b_{\mathrm{II}}d_{\mathrm{II}}-b_{\mathrm{III}}d_{\mathrm{III}}-z(d-d_{\mathrm{II}})-z(b_{\mathrm{III}}+d_{\mathrm{IIII}})\right\}}$
15 	$\frac{d}{2}$	$\frac{1}{12}\left\{(b-z)d^3-(b_{\mathrm{I}}+b_{\mathrm{V}})d_{\mathrm{I}}^3-(b_{\mathrm{II}}-z)d_{\mathrm{II}}^3-b_{\mathrm{III}}d_{\mathrm{III}}^3-(b_{\mathrm{III}}+b_{\mathrm{IIII}})(d_{\mathrm{IIII}}^3-(d_{\mathrm{IIII}}-z)^3)\right\}$	$\frac{(b-z)d^3-(b_{\mathrm{I}}+b_{\mathrm{V}})d_{\mathrm{I}}^3-(b_{\mathrm{II}}-z)d_{\mathrm{II}}^3-b_{\mathrm{III}}d_{\mathrm{III}}^3-(b_{\mathrm{III}}+b_{\mathrm{IIII}})(d_{\mathrm{IIII}}^3-(d_{\mathrm{III}}-z)^3)}{6d}$	$bd-(b_{\mathrm{I}}+b_{\mathrm{V}})d_{\mathrm{I}}-b_{\mathrm{II}}d_{\mathrm{II}}-b_{\mathrm{III}}d_{\mathrm{III}}-z(d-d_{\mathrm{II}})-z(b_{\mathrm{III}}+b_{\mathrm{IIII}})$	$\frac{(b-z)d^3-(b_{\mathrm{I}}+b_{\mathrm{V}})d_{\mathrm{I}}^3-(b_{\mathrm{II}}-z)d_{\mathrm{II}}^3-b_{\mathrm{III}}d_{\mathrm{III}}^3-(b_{\mathrm{III}}+b_{\mathrm{IIII}})(d_{\mathrm{IIII}}^3-(d_{\mathrm{IIII}}-z)^3)}{12\left\{bd-(b_{\mathrm{I}}+b_{\mathrm{V}})d_{\mathrm{I}}-b_{\mathrm{II}}d_{\mathrm{II}}-b_{\mathrm{III}}d_{\mathrm{III}}-z(d-d_{\mathrm{II}})-z(b_{\mathrm{III}}+b_{\mathrm{IIII}})\right\}}$
16 	$\frac{d}{2}$	$\frac{b}{12}(d^3-d_{\mathrm{I}}^3)$	$\frac{b}{6d}(d^3-d_{\mathrm{I}}^3)$	$b(d-d_{\mathrm{I}})$	$\frac{d^3-d_{\mathrm{I}}^3}{12(d-d_{\mathrm{I}})}$
17 	$\frac{d}{2}$	$\frac{d^3}{12}(b-b_{\mathrm{I}})$	$\frac{d^2}{6}(b-b_{\mathrm{I}})$	$d(b-b_{\mathrm{I}})$	$\frac{d^2}{12}$
18 	$\frac{d}{2}$	$\frac{d^3(b-b_{\mathrm{I}})+b_{\mathrm{I}}(d-d_{\mathrm{I}})^3}{12}$	$\frac{d^3(b-b_{\mathrm{I}})+b_{\mathrm{I}}(d-d_{\mathrm{I}})^3}{6d}$	$d(b-b_{\mathrm{I}})+b_{\mathrm{I}}(d-d_{\mathrm{I}})$	$\frac{d^3(b-b_{\mathrm{I}})+b_{\mathrm{I}}(d-d_{\mathrm{I}})^3}{12\left\{d(b-b_{\mathrm{I}})+b_{\mathrm{I}}(d-d_{\mathrm{I}})\right\}}$
19  20  21  22 	Lower Fibres $y=\frac{\frac{bd^2}{2}+b_{\mathrm{I}}d_{\mathrm{I}}\left(d+\frac{d_{\mathrm{I}}}{2}\right)}{bd+b_{\mathrm{I}}d_{\mathrm{I}}}$ Upper Fibers. $x=\frac{\frac{b_{\mathrm{I}}d_{\mathrm{I}}^2}{2}+bd\left(d_{\mathrm{I}}+\frac{d}{2}\right)}{bd+b_{\mathrm{I}}d_{\mathrm{I}}}$ $x+y$ should be $=d+d_{\mathrm{I}}$ and $x:y=c:t$, where c = ultimate resistance to compression, t = ultimate resistance to tension, per square inch.	$\frac{b_{\mathrm{I}}x^3+by^3-(y-d)^3.(b-b_{\mathrm{I}})}{3}$	Lower Fibres. $\frac{b_{\mathrm{I}}x^3+by^3-(y-d)^3.(b-b_{\mathrm{I}})}{3y}$ Upper Fibres. $\frac{b_{\mathrm{I}}x^3+by^3-(y-d)^3.(b-b_{\mathrm{I}})}{3x}$	$bd+b_{\mathrm{I}}d_{\mathrm{I}}$	$\frac{b_{\mathrm{I}}x^3+by^3-(y-d)^3.(b-b_{\mathrm{I}})}{3(bd+b_{\mathrm{I}}d_{\mathrm{I}})}$
23 	Upper Fibres. $x=\frac{\frac{bd^2}{2}+b_{\mathrm{I}}d_{\mathrm{I}}\left(d+\frac{d_{\mathrm{I}}}{2}\right)+b_{\mathrm{II}}d_{\mathrm{II}}\left(d+d_{\mathrm{I}}-\frac{d_{\mathrm{II}}}{2}\right)}{bd+b_{\mathrm{I}}d_{\mathrm{I}}+b_{\mathrm{II}}d_{\mathrm{II}}}$ Lower Fibres. $y=\frac{\frac{b_{\mathrm{II}}d_{\mathrm{II}}^2}{2}+b_{\mathrm{I}}\frac{d_{\mathrm{I}}^2}{2}+bd\left(d_{\mathrm{I}}+\frac{d}{2}\right)}{bd+b_{\mathrm{I}}d_{\mathrm{I}}+b_{\mathrm{II}}d_{\mathrm{II}}}$ where $x+y=d+d_{\mathrm{I}}$ and $x:y=c:t$.	$\frac{b_{\mathrm{I}}x^3+b_{\mathrm{II}}\left\{x^3-(x-d_{\mathrm{II}})^3\right\}+by^3-(b-b_{\mathrm{I}}).(y-b)^3}{3}$	Upper Fibres. $\frac{b_{\mathrm{I}}x^3+b_{\mathrm{II}}\left\{x^3-(x-d_{\mathrm{II}})^3\right\}+by^3-(b-b_{\mathrm{I}}).(y-d)^3}{3x}$ Lower Fibres. $\frac{b_{\mathrm{I}}x^3+b_{\mathrm{II}}\left\{x^3-(x-d_{\mathrm{II}})^3\right\}+by^3-(b-b_{\mathrm{I}}).(y-d)^3}{3y}$	$bd+b_{\mathrm{I}}d_{\mathrm{I}}+b_{\mathrm{II}}d_{\mathrm{II}}$	$\frac{b_{\mathrm{I}}x^3+b_{\mathrm{II}}\left\{x^3-(x-d_{\mathrm{II}})^3\right\}+by^3-(b-b_{\mathrm{I}}).(y-d)^3}{3(bd+b_{\mathrm{I}}d_{\mathrm{I}}+b_{\mathrm{II}}d_{\mathrm{II}})}$

[1] See Glossary of Symbols on page 167.

TABLE I.[1] (*Continued.*)

DISTANCE OF EXTREME FIBRES, MOMENTS OF INERTIA AND RESISTANCE, SQUARE OF RADIUS OF GYRATION, AND AREA OF DIFFERENT SHAPES OF CROSS-SECTIONS.

Number and Form of Section.	Distance of Neutral axis M.....N from extreme fibres.	Moment of Inertia *i*.	Moment of Resistance. *r*.	Area. *a*.	Square of Radius of Gyration. ρ^2
24 	$\frac{d}{2}$	$\frac{(b-z)d^3-(b_1-z)d_1^3-b_{11}d_{11}^3}{12}$	$\frac{(b-z)d^3-(b_1-z)d_1^3-b_{11}d_{11}^3}{6d}$	$(b-z)d-(b_1-z)d_1-b_{11}d_{11}$	$\frac{(b-z)d^3-(b_1-z)d_1^3-b_{11}d_{11}^3}{12\{(b-z)d-(b_1-z)d_1-b_{11}d_{11}\}}$
25 	$\frac{d}{2}$	$\frac{(b-b_1)\{d^3-d_{111}^3+(d_{111}-z)^3\}+b_1d_1^3-b_{11}d_{11}^3}{12}$	$\frac{(b-b_1)\{d^3-d_{111}^3+(d_{111}-z)^3\}+b_1d_1^3-b_{11}d_{11}^3}{6d}$	$(b-b_1)(d-z)+b_1d_1-b_{11}d_{11}$	$\frac{(b-b_1)\{d^3-d_{111}^3+(d_{111}-z)^3\}+b_1d_1^3-b_{11}d_{11}^3}{12(b-b_1)(d-z)+b_1d_1-b_{11}d_{11}}$
26 	$\frac{d}{2}$	$\frac{b(d^3-d_1^3)+b_1(d_{11}^3-d_1^3)}{12}$	$\frac{b(d^3-d_1^3)+b_1(d_{11}^3-d_1^3)}{6d}$	$b(d-d_1)+b_1(d_{11}-d_1)$	$\frac{b(d^3-d_1^3)+b_1(d_{11}^3-d_1^3)}{12\{b(d-d_1)+b_1(d_{11}-d_1)\}}$
27 	$\frac{d}{2}$	$\frac{bd^3+b_1d_1}{12}$	$\frac{bd^3+b_1d_1^3}{6d}$	$bd+b_1d_1$	$\frac{bd^3+b_1d_1^3}{12(bd+b_1d_1)}$
28 	$\frac{d}{2}$	$\frac{bd^3-b_1(d_1^3-d_{11}^3)-zd_{11}^3}{12}$	$\frac{bd^3-b_1(d_1^3-d_{11}^3)-zd_{11}^3}{6d}$	$bd-b_1(d_1-d_{11})-zd_{11}$	$\frac{bd^3-b_1(d_1^3-d_{11}^3)-zd_{11}^3}{12(bd-b_1(d_1-d_{11})-zd_{11})}$
29 	d	$\frac{bd^3}{3}$	$\frac{bd^2}{3}$	bd	$\frac{d^2}{3}$
30 	d	$\frac{d^4}{3}$	$\frac{d^3}{3}$	d^2	$\frac{d^2}{3}$
31 	d	$\frac{bd^3}{12}$	$\frac{bd^2}{12}$	$\frac{bd}{2}$	$\frac{d^2}{6}$
32 	d	$\frac{bd^3}{4}$	$\frac{bd^2}{4}$	$\frac{bd}{2}$	$\frac{d^2}{6}$
33 	Lower Fibres. $\frac{d}{3}$ Upper Fibres. $\frac{2}{3d}$	$\frac{bd^3}{36}$	Lower Fibres. $\frac{bd^2}{12}$ Upper Fibres. $\frac{bd^2}{24}$	$\frac{bd}{2}$	$\frac{d^2}{18}$

Number and Form of Section.	Distance of Neutral axis M.....N from extreme fibres.	Moment of Inertia *i*.	Moment of Resistance. *r*.	Area. *a*.	Square of Radius of Gyration. ρ^2
34 	$\frac{b}{\sqrt{2}} = \frac{b}{1.4142}$	$\frac{b^4}{12}$	$0.1179\ b^3$	b^2	$\frac{b^2}{12}$
35 	$\frac{d}{2}$	$\frac{d^4}{12}-\frac{11}{14}r^4$	$\frac{d^3}{6}-\frac{11}{7d}r^4$	$d^2-\frac{22}{7}r^2$	$\frac{7d^4-66r^4}{12(7d^2-22r^2)}$
36 	r	$\frac{11}{14}r^4-\frac{d^4}{12}$	$\frac{11}{14}r^3-\frac{d^4}{12r}$	$\frac{22}{7}r^2-d^2$	$\frac{66r^4-7d^4}{12(22r^2-7d^2)}$
37 	$\frac{d}{2}$	$\frac{\vartheta^4-\vartheta_1^4}{20}+\frac{h(bh^2+d^3-\vartheta^3)}{12}-\frac{h\{d_1^3-(d_1-z)^3-zh^2\}}{12}$	$\frac{\vartheta^4-\vartheta_1^4}{10d}+\frac{h(bh^2+d^3-\vartheta^3)}{6d}-\frac{h\{d_1^3-(d_1-z)^3-zh^2\}}{6d}$	$\frac{11}{14}(\vartheta^2-\vartheta_1^2)+2h(b-z)$	$\frac{7}{30}\left\{\frac{3(\vartheta^4-\vartheta_1^4)+5h(bh^2+d^3-\vartheta^3)-5h\{d_1^3-(d_1-z)^3-zh^2\}}{11(\vartheta^2-\vartheta_1^2)+28h(b-z)}\right\}$
38  39 	$\frac{d}{2}$	$\frac{11}{224}bd^3$	$\frac{11}{112}bd^2$	$\frac{11}{14}bd$	$\frac{d^2}{16}$
40  41 	$\frac{d}{2}$	$\frac{11}{224}(bd^3-b_1d_1^3)$	$\frac{11}{112d}(bd^3-b_1d_1^3)$	$\frac{11}{14}(bd-b_1d_1)$	$\frac{bd^3-b_1d_1^3}{16(bd-b_1d_1)}$
42 Corrugated Iron.  Breadth of each sheet = *b*.			$\frac{4}{15}dbh$		

Refering back to Figure 1, we should have for Part I: —

$$i_1 = \frac{11}{14}r_1^4.$$

For Part II we should have: —

$$i_{11} = \frac{b_{11}h_{11}^3}{12}$$

And for Part III: —

$$i_{111} = \frac{b_{111}h_{111}^3}{12}$$

[1] See Glossary of symbols on page 167.

For the distances of individual centres of gravity from main centre of gravity we should have for Part I: $d_{I}-d$.

For Part II: $d_{II}-d$.

And for Part III: $d-d_{III}$.

Therefore the moment of inertia, i, of the whole deck-beam would be: —

$$i=\left\{(d_{I}-d)^2.a_{I}+\frac{11}{14}\mathfrak{r}_{I}^4\right\}+\left\{(d_{II}-d)^2.a_{II}+\frac{b_{II}h_{II}^3}{12}\right\}+\left\{(d-d_{III})^2.a_{III}+\frac{b_{III}h_{III}^3}{12}\right\}$$

But $a_{I}=\frac{22}{7}\mathfrak{r}_{I}^2$

Further, $a_{II}=b_{II}\ h_{II}$,

And $a_{III}=b_{III}\ h_{III}$, which, inserted above, gives for

$$i=\frac{\mathfrak{r}_{I}^2}{14}\left\{11\mathfrak{r}_{I}^2+2(d_{I}-d)^2\right\}+\frac{b_{II}h_{II}}{12}\left\{h_{II}^2+12\,(d_{II}-d)^2\right\}+\frac{b_{III}h_{III}}{12}\left\{h_{III}^2+12(d-d_{III})^2\right\}$$

CALCULATION OF STRAINS AND STRESSES.

As we have already noticed, the stress should exceed the strain as many times as the adopted factor-of-safety, or: —

$$\frac{\text{Stress}}{\text{Strain}}=\text{factor-of-safety.}$$

Or, stress = strain × factor-of-safety.

This holds good for all calculations, and can be expressed by the following simple fundamental formula: —

$$v=s.f \qquad (1)$$

Where v = the ultimate stress in pounds.
" s = " strain "
And where f = the factor-of-safety.

COMPRESSION.

In pieces under compression the load is *directly* applied to the material. In short pieces, therefore, which cannot give sideways, the strain will just equal the load, or we have: —

$$s=w.$$

Where s = the strain in pounds.
And where w = the load in pounds.

The stress will be equal to the area of cross-section of the piece being compressed, multiplied by the amount of resistance to compression its fibres are capable of.[1] This amount of resistance to compression which its fibres are capable of is found by tests, and is given for each square inch cross-section of a material. A table of constants for the resistance to crushing of different materials will be given later on.

In all the formulæ these constants are represented by the letter c.

We have, then, for the stress of short pieces under compression:—

$$v=a.c$$

Where v is the ultimate stress in pounds.
Where a is the area of cross-section of the piece in inches.
And where c is the ultimate resistance to compression in pounds per square inch.

Inserting this value for v, and w for s in the fundamental formula (1), we have for short pieces under compression, which cannot yield sideways: —

$$a.c=w.f, \text{ or: —}$$

$$w=a.\left(\frac{c}{f}\right). \qquad (2)$$

Where w = the *safe* total load in pounds.
Where a = the area of cross-section in inches.
And where $\left(\frac{c}{f}\right)$ = the *safe* resistance to crushing per square inch.

Example.

What is the safe load which the granite cap of a 12″ x 12″ *pier will carry, the cap being twelve inches thick?*

The cap being only twelve inches high, and as wide and broad as high, is evidently a short piece under compression, therefore the above formula (2) applies.

The area is, of course: $a=12.12=144$ square inches.

The ultimate resistance of granite to crushing per square inch is, say, fifteen thousand pounds, and using a factor-of-safety of ten, we have for the safe resistance: —

$$\frac{c}{f}=\frac{15000}{10},=1{,}500 \text{ lbs.}$$

Therefore the safe load w on the block would be: —

$$w=144.\ 1500=216{,}000 \text{ pounds.}$$

Where long pieces (pillars) are under compression, and are not secured against yielding sideways, it is evident they would be liable to bend before breaking. To ascertain the *exact* strain in such pieces is probably one of the most difficult calculations in strains, and in consequence many authors have advanced different theories and formulæ. The writer has always preferred to use Rankine's formula, as in his opinion it is the most reliable. According to this, the greatest strain would be at the centre of the length of the pillar, and would be equal to the load, plus an amount equal to the load multiplied by the square of the length in inches, and again multiplied by a certain constant, n, the whole divided by the "square of the radius of gyration" of the cross-section of the pillar. We have therefore for the total strain at the centre of long pillars: —

$$s=w+\frac{w.l^2n}{\rho^2}$$

Where s = the strain in pounds.
" w = the total load in pounds.
" l = the length in inches.
" ρ^2 = the square of the radius of gyration of the cross-section.
" n = a constant, as follows: —

TABLE II.

Material of pillar.	Both ends of pillar smooth (turned or planed.)	One end smooth (turned or planed) other end a pin end.	Both ends pin ends.
Cast-iron	0.0003	0.0004	0.00057
Wrought-iron	0.000025	0.000033	0.00005
Steel	0.00002	0.000025	0.000033
Wood	0.00033	0.00044	0.00067
Stone	0.002		
Brick	0.0033		

The stress of course will be as before: —

$$v=a.\ c.$$

Where v = the ultimate stress in pounds.
" a = the area of cross-section in inches.
" c = the ultimate resistance to crushing per square inch.

Inserting the values for strain, s, and stress, v, in the fundamental formula (1) we have: —

$$a.\ c=\left(w+\frac{w.l^2.n}{\rho^2}\right)f.$$

or: —

$$a.\left(\frac{c}{f}\right)=w\left(1+\frac{l^2n}{\rho^2}\right)$$

or: —

$$w=\frac{a.\left(\frac{c}{f}\right)}{1+\frac{l^2.n}{\rho^2}} \qquad (3)$$

Where w = the *safe* total load on the pillar.
" a = the area of cross-section in inches.
" ρ^2 = the square of the radius of gyration of the cross-section.
" l = the length in inches.
" $\frac{c}{f}$ = the *safe* resistance to crushing per square inch.

Example.

What safe load will a 12″ x 12″ *brick pier carry, if the pier is ten feet long, and of good masonry?*

The area of cross-section will be: —

$$a=12.12=144 \text{ square inches.}$$

The square of the radius of gyration according to Section No. 1 in Table I would be: —

$$\frac{d^2}{12}, \text{ and as } d=12, \text{ we have } \rho^2=\frac{12.12}{12}=12$$

For the safe resistance to crushing per square inch, we have, using a factor-of-safety of ten, and considering the ultimate resistance to be 2,000 pounds per square inch,

$$\left(\frac{c}{f}\right)=\frac{2000}{10}=200 \text{ lbs.}$$

The length will be ten feet, or one hundred and twenty inches; therefore: —

$$l^2=14.400$$

For n we must use (according to Table II), for brickwork: —

$$n=0.0033;$$

Therefore the safe total load on the pier would be: —

$$w=\frac{144.\ 200}{1+\frac{14400.\ 0{,}0033}{12}}=\frac{28800}{1+3{,}96}=5806 \text{ lbs.}$$

In all formulæ where constants and factors of safety are used, it will be found simpler and avoiding confusion to immediately reduce the constant by dividing it by the factor-of-safety, and then using only the reduced or *safe* constant.

Thus if $c=48{,}000$ pounds, and if $f=4$, do not write into your formula for $\left(\frac{c}{f}\right)=\frac{48000}{4}$, but use at once for $\left(\frac{c}{f}\right)=12000$.

Materials in compression that have an even bearing on all parts of the bed will stand very much more compression to the square inch than materials with rough, uneven or rounded beds, or where the

[1] This is not theoretically correct, as there is in every case a tendency for the material under compression to spread; but it is near enough for all practical purposes.

bearing is on part of the cross-section only, as in the case of pins (in trusses) bearing on eye-bars. It is usual in calculating to make allowance for this. Columns with perfectly even bearing on all parts of the bed (planed or turned iron or dressed stone) will stand the largest amount of compression. Columns with rough, rounded or uneven ends are calculated the same as for pin-ends of eye-bars. In the table (II) giving the values for n of Rankine's formula for compression, the different values for smooth and also for pin ends are given.

[To be continued.]

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

WAXING GEORGIA-PINE FLOORS.

To the Editors of the American Architect:—

Dear Sirs,— Can you give me any information with regard to the usual effect of prepared-wax on Georgia pine? I have floored a house with clear Georgia pine, and given the floor two good coats of *hot* pure linseed-oil, allowing each to dry thoroughly, but the final coating of prepared-wax, from a reliable manufacturer, proves highly unsatisfactory. No amount of brushing removes a general muddy, streaked appearance. Can this be accounted for by the very small proportion of turpentine in the wax acting on the pitch in the pine? I see no remedy but scraping the floors and using a "hard-oil-finish."

Any information you can give me with regard to pitch-pine floors which have been successfully waxed, may be appreciated by others than Yours, very respectfully, ———

[Our correspondent has suggested a very probable cause of the mischief, but we believe the trouble began with the application of the "hot" oil, which must have softened the resinous particles in the wood. If the flooring had been "sap-run," which, of course, ought not to have been the case, the use of hot oil would have been judicious.—Eds. American Architect.]

GROWTH OF ARCHITECTURAL FORMS,

To the Editors of the American Architect:—

Dear Sirs,— Buildings of all kinds and in all ages originate, grow into form, and are finished in two ways — from within out, and from without in: comparatively, as in the vegetable kingdom, there are two forms of growth — endogenous, forms produced from within; exogenous, forms produced from without. The grasses, corn-stalks, wheat, reeds, palm-trees, grow from the inside, while our common trees and shrubs grow from the outside.

An old-fashioned country barn grew from the inside out. The farmer wanted a room to stow away hay in, and so he planned the inside just as he wanted to have it to suit his purpose — made a bay long enough, wide enough, and high enough, etc. and then let the outside look as it might — an endogenous growth.

Our finest country cottages of to-day grow from the outside in: the architect thinks how the cottage will look to people outside: an exogenous growth.

Cleaving off their steeples and front ends clear to the ground, Park Street Church and the Old South exhibit the old country barn architecture: they are wood-and-brick shells put over the extremely important inside. Later churches in Boston have an outside beauty as well as an inside beauty.

Grecian temples were especially beautiful outside. Solomon's Temple grew from the inside, and its outside form was accidental; it might have happened to be beautiful, and it might have happened to be ugly. The restorer had nothing to do with either its inside or its outside looks. His duty was to have no theory about either the form or appearance of this or any other Holy House: he was bound by oath of fidelity to truth to draw as he was ordered by the description according to his understanding of it after years of study. A restorer of lost forms, like any other scientific man, has no right to have an opinion, a notion, a view, or to be ingenious: he must get at the best results he can, and then give them just as they are — beautiful or ugly, pleasing or not.

But is the front end of the temple, as restored, ugly? We must not judge a piece of a thing, cut out and off, and looked at alone. Turn to Plate H, the first in "*The Holy Houses, or Solomon's Temple,*" and put any other form you see in place of the Central House and see if your form will look better than the one there given. First, the flat-roofed house is in a whole country of flat-roofed houses: a Grecian roof would not do there, however beautiful in itself. Second, that house is in the midst of a great system of forms that are in harmony. The Outer Court with its three gates forms the lowest member of the system: a low, wide-spread plateau, nine hundred feet square. The Inner Court with its three gates forms the middle and higher member: a wide-spread, low plateau, six hundred feet square. The Central House with its two groups of priests' houses, the sea, and altar, form the uppermost member occupying a surface three hundred feet square. That is, the vast group or system of structures as a whole grew narrower and narrower, or smaller and smaller upwards in three stories. In details, every one of the six gates grew narrower and narrower inward, or towards the Central House, in three portions — not in vertical height only, but especially in ground plan. Next, the altar grew smaller and smaller upwards in three stories, and every one of the thirty little buildings, on the right and left of the Central House, grew smaller upwards in three stories.

Thus far all the forms described grew smaller and smaller upwards in three stories, or smaller and smaller inwards.

Does not this system need some balance, some exception? The central house is very much the largest single form: in fact, just exactly large enough to balance all the small forms on both courts; and it grows larger and larger upwards in bolder and bolder outjuts. No other form will fit in here, and hence it demands acceptance.

That the Temple grew *from within* is a fact easily proved. We first notice that in the Kings (Chapt. vi.) description every measure is an inside one; all outside measures are in Ezekiel, with many inside ones.

But the history of the temple-forms in the Central House is this: The amount of text in the commandments given on Mount Sinai required two stone slabs, each two cubits by one. These required a chest two and a half by one and a half. A room, the Holy of Holies, was made to receive this chest or ark. In front of this room was a second, and a court surrounded the little house (tabernacle) that had these two rooms in it. The temple followed the tabernacle and gave rise to the ground-floor room of the temple, seen best in Plate G′ (G prime). The Galleries of Arms of David's wars were added around two sides and the west end. These galleries were so formed as to receive the arms; one high wall was cut up into many low walls, as best seen in Plate G (not G prime): and it is these galleries, produced by inside needs, that give the flat face of Plate G2

The front porch was added as a fan, or sun and storm shade over the three doors and the winding stairs. Almost nobody could go into the temple; and this porch was enough. According to the Septuagint a great tapestry veil filled all the space between Jachin and Boaz, as seen in Plate M. Ezekiel tells us also that the very place in which this veil hung was called the tent (not "tabernacle" of our English Bibles); and a cloth veil would warrant the term "tent." Thus a shallow porch (sixteen and one-half feet deep) would be deep enough, being closed against storm by the tapestry.

The front porch of the Capitol needed to be larger, because the royal court must enter thereby; and it was nearly six times as large as the front porch of the temple (Plate G9).

Author of the "*Holy Houses, or Solomon's Temple.*"

NOTES AND CLIPPINGS

The Electric Light in Light-houses. — The recent experiments at the South Foreland on light-house illumination by means of electricity, give particular interest at this time to the following considerations on the subject by H. Lucas, delivered to the French Academy of Sciences. In the French light-houses lit by the voltaic arc, such as those of Dunkirk, Calais, Griz-nez and others, four horse-power engines are employed to produce a light of 450 *becs carcel.* The current is 55 ampères, the resistance of the arc 0.43 ohms, and the difference of potential between the carbon-points is 23.65 volts. It follows that, of

Glossary of Symbols. — The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.: —

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches.
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars.
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches.
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches.
𝔇 = *diameter*, in inches.
𝔯 = *radius*, in inches.
μ = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle.*

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{I}, a_{II}, a_{III}, etc., or b. b_{I}, b_{II}, b_{III}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance: —

m = moment or bending moment at *centre*.
m_A = " " " *point A.*
m_B = " " " *point B.*
m_X = " " " *point X.*
s = strain at *centre*.
s_B = " *point B.*
s_X = " *point X.*
v = stress at *centre*.
v_D = " *point D.*
v_X = " *point X.*
w = load at *centre*.
w_A = " *point A.*

the four horse-power absorbed, only 1.76 are utilized in the arc, the rest being taken up in belting and the machinery. The voltaic arc presents two advantages over mineral-oil lamps for light-house purposes, namely, greater power of penetrating the atmosphere, and less cost per unit of light; but, in the opinion of M. Lucas, the flickering of the arc is a drawback, and it is due rather to the movement of the bluish light of the arc round the glowing points, than to the changes in length. He therefore suggests what, by the way, has been suggested before in this country, that a purely-incandescent light should be used. The conditions which this light should fulfil are: (1) The focus of light ought to present the form of a surface of revolution having a vertical axis, so that the light be equally distributed in all azimuths. (2) The use of quantity-current, of low electro-motive force. (3) The incandescent-wick, or electropyre, should be of carbon, because it can withstand very high temperatures. From an investigation which he has made, M. Lucas finds that 400 *becs carcel* can be obtained with a current of 170 ampères and a resistance of 0.04 ohms of incandescent-carbon; or, in other words, with an electro-motive force of 7 volts and 1200 watts of energy. Under these conditions the unit of light does not require for the incandescent-wick more mechanical power than the voltaic-arc used now in French light-houses. The temperature of the carbon is estimated at 4000° Centigrade. It is known that a smoke of carbon, deposited on the glass of incandescent-lamps, in time cuts off the light of the filament; and M. Lucas attributes this to the oxygen in the bulb, the rapidity of the deposition being in proportion to the pressure of the gas inside. The oxygen combines with carbon near the junction of the latter with the metal electrodes, and the carbonic-oxide formed is dissociated at the hotter parts of the carbon, leaving the carbon-particle free to deposit on the glass. M. Lucas comes to the conclusion that, in order to secure a high vacuum, the gases emitted by the solids in the lamp should be absorbed by an absorbent within the bulb. Otherwise it will not be easy to prevent the deposition of carbon-dust on the interior of the glass-envelope. — *Engineering.*

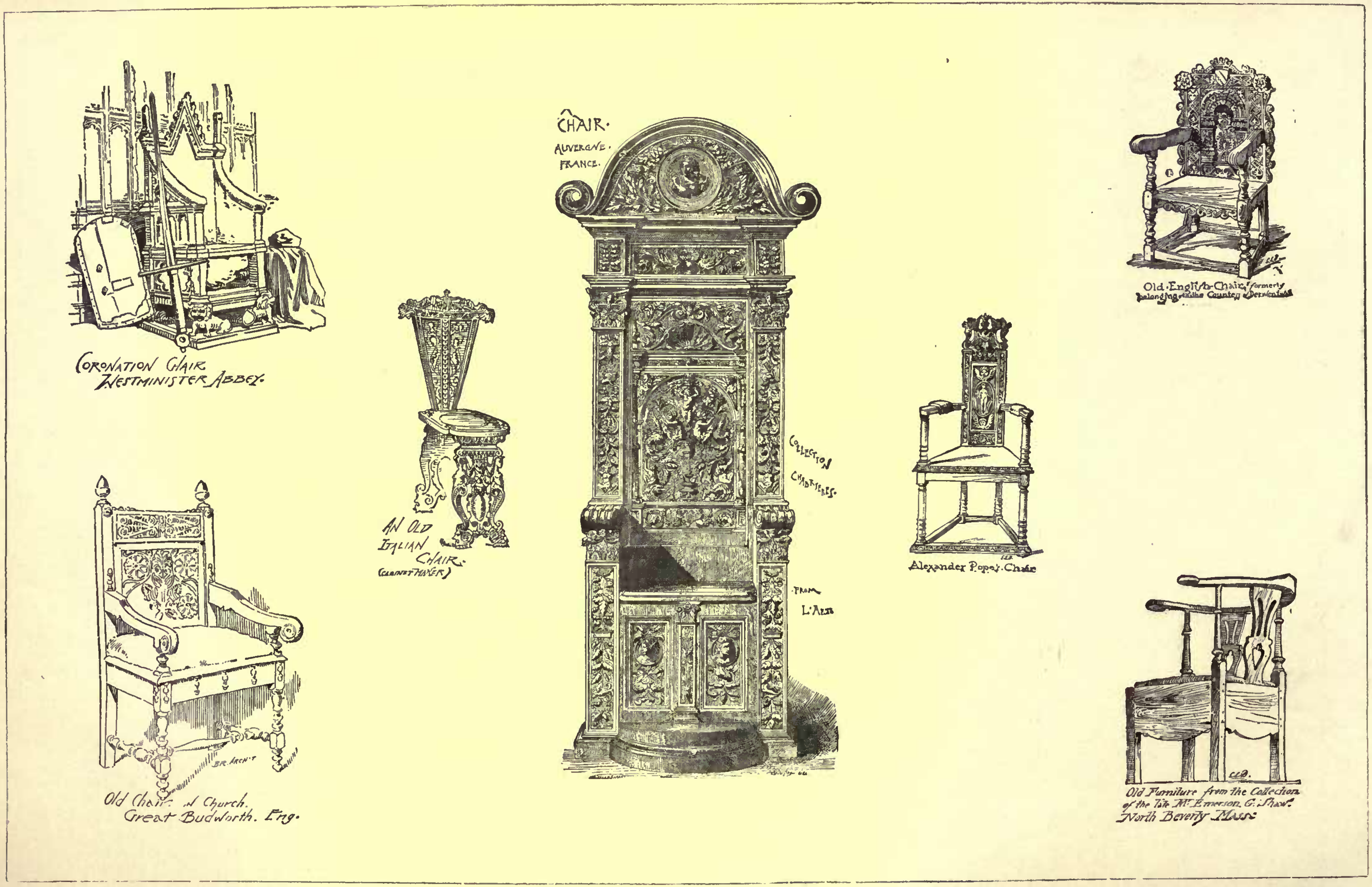
Reclaiming Lands in Florida. — The Disston Land and Improvement Company is doing some marvellous work in Florida, in redeeming thousands of acres of land which are now under water. Already immense tracts have been thus made available, and it has been demonstrated that there is no better land in the State than that thus reclaimed. The company operates under a law of the State which allows it one-half of the land rendered available, and expects to reap a rich harvest before it finishes the improvements contemplated. The South Florida Railroad, from Sanford to Tampa, crosses the State on a dividing-ridge, and from this ridge, looking south, there is a continual, but gradual depression in the land to the southern extremity of the State. The land to the south of this ridge is different from that on its north, in that it is not at all undulating, but spreads out in a vast plain, gradually inclined toward the north. The Disston Company is utilizing this work of nature. Lake Kissimmee is in the midst of a series of lakes, and its northern point just touches the South Florida Railroad at Kissimmee City. This lake is a very long and narrow one, reaching toward Lake Okeechobee, with which it has been connected by canalling the intervening series of lakes. The lakes around Kissimmee have been connected to it by canals, giving a continual outlet to Okeechobee. Thus the areas of these lakes are lessened by the immense flow which finds its way to Okeechobee, and from thence to the Gulf on one side, and to the Atlantic on the other, canals reaching from the immense lake to these two great bodies of water on each side. By this canalling process the level of Lake Kissimmee has been lowered six feet, and that of the lakes surrounding it proportionately. In this manner the Disston Company proposes to reclaim thousands of acres of land, one-half of which will go to the State, and the other half to the company. The land which is thus made useful is not only that immediately surrounding these lakes, but extends in many places over miles of swampy bottoms. Since these lakes have been connected it is now an easy matter to start by boat in Lake Kissimmee, in the centre of lower Florida, and proceed by water through Lake Okeechobee to either the Atlantic or the Gulf. It is said that Georgia's great swamp, the Okefenokee, can be as easily reclaimed. This immense morass, forming a distinct basin much lower than the surrounding country, is, at its lowest point, within but a few miles of the St. Mary's River, the level of which is below that of the swamp. These two, connected by canal, the great Okefeenokee is drained, and a magnificent area of land is ready for the plough. It is only a question of time. — *Atlanta (Ga.) Constitution.*

The West Front of Milan Cathedral. — An international competition is advertised in the Italian papers for a design for a new west front to the cathedral at Milan. No fewer than fifteen premiums are offered, of a total value of £3000. The designs will be adjudicated upon by a jury of architects of different nationalities.

TRADE SURVEYS

There is no good reason for indulging in pessimistic views on account of the unfavorable developments of the past week or two. Some business which ought to have been transacted is withheld; a few million dollars' worth of orders covering material of all kinds, which should have been placed, have not been placed; transactions which might foot to a few million dollars in real estate, have not been terminated, simply because of the spirit of indifference which has been permitted to creep into business channels. The fundamental conditions are as favorable and as promising as they have been at any time during the past six months. The labor question is the only really unsettling question in business; it is, of course, possible for the labor strikes to assume an aggravated form, and involve interests which have thus far escaped and lay the foundation for mischief, which so far has been avoided. The laborers everywhere are anxious to resume work, and if Bradstreet's estimate of the number idle is correct, the matter is a very trifling one. The Southwestern strike will not be permitted to cross the Mississippi River, if labor leaders and railway managers can prevent it. At present writing, the bituminous miners' strike is likely to continue and extend to fields not now affected. This strike properly understood, however, is simply an effort to restore wages to what they were, and to exact a fulfilment of promises given by employers as a consideration for the acceptance of lower wages a year or eighteen months ago. Labor troubles elsewhere are quieting down. At no time for years has there been so little disemployment. At no time since 1882 has there been as much business in hand and in sight. The underlying facts and conditions and tendencies when shorn of all their poetry prove that a heavy volume of business is crowding upon our various markets. A summary of the real estate transfers in New York, Brooklyn, Philadelphia, Pittsburgh and Chicago shows that the same activity prevails and that real estate is holding its own without difficulty. Building operations are being entered upon with something but little short of enthusiasm, if that term is admissible. Within a week or ten days considerable manufacturing has been projected. A great deal of it is in smaller towns. There seems to be an inclination among a great many of the smaller manufacturing concerns springing up to avoid the larger cities, possibly because of the stricter labor control exercised in them and partly because of high taxation. Whatever the reason may be, the smaller towns are preferred because of the equal facilities afforded for transportation. The railroad companies are making traffic rates designed to stimulate the development of manufacturing in small towns. During the past few days a large number of public buildings, banks, educational institutions, places of amusement, and large stores have been projected. The interior of Pennsylvania seems to be animated with the genuine building fever. In Reading, Pottsville, York and Lancaster, there is particular activity. The advantages afforded by cheap coal and lumber and cheap labor are being appreciated. It is unnecessary to select a particular locality in order to find evidences of industrial thrift or building activity. It is more difficult to find evidences of inactivity. The iron trade, which may be taken as a fair barometer of trade conditions generally, is, in spite of several drawbacks, in an improving condition. This is due in part to the fact that it has been and is nearly absolutely free from labor agitations. In Eastern Pennsylvania, mills and furnaces are oversold for months. One or two exceptions should be noted, namely, bar-iron and plate-iron. These exceptions are due in part to the steady inroads of steel of various makes, which are destined to supplant numerous kinds of iron. In Western Pennsylvania there is more vigor in the iron trade; a large amount of business has been transacted within a week; a new $1,000,000 mill is being erected there, and our special information is to the effect that the enterprises contemplating removal to that city and vicinity will increase the value of the manufacturing plant some $20,000,000 within the next six or eight months, provided the contemplated projects are carried out. The entire natural-gas belt is being visited and investigated by manufacturing interests. The coal syndicate made a combination to extend one year and advanced prices. Stronger prices are probable in several branches of the iron trade. The same favorable conditions exist in the more Western markets, but there is nothing to alarm consumers of iron and steel, as to the probability of much higher prices. Our latest advices from Michigan lumber centres and from Savannah, Pensacola, and one or two other lumber-shipping points in the South confirm the views heretofore expressed, as to abundant supplies and steady prices. The consumption of yellow pine is steadily increasing, and it is being applied to a greater variety of special uses. A large amount of business has been done in all Atlantic cities from Boston to Baltimore for spring and summer deliveries, and large shipments are now on their way to fill urgent orders. Three or four extensive yellow pine purchases have been about consummated in Florida and Georgia. The low freight-rates from the Pacific coast has created an exceptionally active demand for California redwood. Methods of manufacturing lumber upon the Pacific coast have recently been improved, and the lumber interests there are earnestly seeking an Eastern outlet. Builders have not been called upon to pay higher prices this year than last throughout the New England and Middle States; dealers are more anxious to do a large business than to exact the highest possible prices. White pine is abundant and is held at a slightly higher figures in the West, but thus far, when the lumber comes East it finds its way into dealers' yards, at about old figures; this is due perhaps to the liberal supplies in nearly all the yards, both in tide-water cities and in lake ports within easy reach. An estimate of the log cut upon the upper Mississippi to be sawed in the mills north of Minneapolis has been recently put at 335,000,000 feet. The estimated shortage for Minneapolis mills was put at 27,000,000 feet. Western dealers endeavor to argue that higher lumber prices are inevitable, but in the case of yellow pine no such claims are made, while in the case of hemlock, shipments are virtually in the hands of railroad companies who have damaged that lumber very seriously by discriminating rates. Hard woods of all kinds are showing some signs of scarcity, especially for dry lumber. The old districts are unable to render any assistance to the markets, and new territory is being brought within reach of market by railway construction and by the erection of saw-mills. The sash, door and blind factories are generally low in stocks in the East. Western factories have nearly all the work they can handle. The uncertainty as to the cost of labor, and to some extent as to the cost of material has checked what would otherwise have by this time developed itself into quite a bitter competition; as it is, building material of all kinds and manufacturers' supplies are being held at firm prices. There is a probability of development of some interesting competition between these interests in the event of the settlement of labor disturbances favorably to employers; at present nails are held at 2.40 to 2.50; merchant bar at one and one-half to two cents per pound; plate-iron at two cents; sheet-iron at three and one-half to four; tin-plate is without fluctuation; lath and shingles are held very firmly, but more abundant supplies will likely weaken prices within thirty days. In cements, paints, oils, etc., no change has taken place. Manufacturers are busy, and stock will be abundant; window-glass is likely to improve somewhat in price if the statements are correct as to the Belgian supplies. The American factories will run full time to the end of the season.

Museum of Antiquities at Athens. — All the scattered antiquities of Athens will be brought together in the Central Museum, with the exception of statues and reliefs that belong to the Acropolis. The latter will remain in their special museum. All inscriptions go to the Central Museum. The latter is to be arranged historically, and the gaps made by antiquities which have left Greece and been preserved elsewhere will be filled by plaster-casts. The Acropolis and Central Museum will be free to the public on Saturdays and Sundays; on other days one franc will be charged. Drawings of objects may be taken, but squeezes and photographs are a Government monopoly, which will be sold or permitted to be taken as special favors. — *New York Times.*


Coronation Chair
Westminister Abbey.
An Old Italian Chair.
(Cabinet Maker)
Chair.
Auvergne.
France.
Collection
Chabrières.
From
L'Art
Alexander Pope's Chair
Old English Chair, formerly
Old Chair in Church.
Great Budworth. Eng.
Old Furniture from the Collection
of the late Mr. Emerson G. Shaw.
North Beverly Mass.

CHAIRS.

The American Architect and Building News.

Vol. XIX. Copyright, 1886, Ticknor & Company, Boston, Mass. No. 537.

APRIL 10, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

OUR readers know that we have always regarded the modified project for the Broadway Arcade Railway in New York as the best studied and most promising plan for the improvement of that thoroughfare which has yet been devised, and we are glad to find that the *Record and Guide*, an excellent authority on such points, takes the same position. The new and rather extravagant scheme of the District Railway Company, comprising "ferflax" partitions and a variety of other novelties, is, apparently, being pushed vigorously into public notice, in order that all possible advantage may be taken by its promoters of the probable forfeiture of the charter of the underground line, and the *Record and Guide* takes occasion to make a rather elaborate comparison between the two projects now prominent. As presented in the diagrams illustrating the paper, it must be acknowledged that the District scheme looks very ill-considered. Taking the distance between the curbs as the width of the railway location, the District plan proposes to divide this, by "ferflax" partitions, into six sections, of which the two outer are to be used for water, gas and sewer pipes, while the four intermediate ones will be occupied by the trains. The distance between the curbs over a portion of the street is forty-four feet, and the *Record and Guide* shows that if the water and gas pipes now existing in Broadway were to be placed in the side sections, allowing four and one-half inches only between the outside of the pipe and the walls of the section, the remaining space would be much too small to allow four cars of standard size to stand side by side, without leaving any room for clearance of trains, or for the ferflax partitions. As the District Company is said to claim that trains of cars of the usual size will run over its road, it is strange that such a serious miscalculation should have been made at the very start. In the Arcade plan, the full width of the street between the curbs is used for the four tracks, and, giving eleven feet for each, this allows the usual gauge of ten feet eight and one-half inches from centre to centre of tracks, with a surplus space in the middle for setting the row of iron columns which the design of the Arcade contemplates. The pipe gallery in this scheme is below the tracks, which run over it on iron beams, so that the water and sewer pipes are not only readily accessible, and accommodated without crowding, but, by their position, are available for draining the sub-basements of the buildings on either side of the street. Another point which the *Record and Guide* does not mention, is that water or sewer pipes crowded, with a mass of steam, pneumatic and gas pipes and electric wires, behind the ferflax partitions of the District road, would be practically inaccessible for making connections or repairs. To descend to them from the street would be impossible, since those lying the lowest would be covered with a maze of smaller pipes, wires, and cables, and to work on them from the tunnel would be equally out of the question, since the men would have to stand on the tracks to work at them; while under the Arcade system, it would only be necessary for a man to swing himself down between the beams which carry the track over the pipe gallery, to find himself immediately in a light, spacious, well-paved subway, in which he could walk upright the whole length of the street, and inspect or repair the pipes at his leisure, the trains, meanwhile, passing above his head.

IT is singular that, with charters already secured, some sort of rapid-transit road through Broadway should not have been begun long ago. It is hinted that difficulties in the way of raising money have prevented the execution of any plan, but to our mind this circumstance is still more extraordinary than the other. A rapid-transit road through Broadway, built and operated with the economy and efficiency which the Arcade scheme seems to promise, would be a veritable mine of gold for its owners. The Sixth Avenue Elevated Roads, with two tracks each, have been very profitable, and the ordinary traffic of both these thoroughfares combined would probably be less than one-fourth that of Broadway. To take the surface roads as an illustration, the Broadway line is said to have cost less than one hundred thousand dollars for construction and equipment, yet its property and franchise are mortgaged as security for some two and a half million dollars' worth of bonds, and the profits of the line, the fares on which are restricted by law to five cents, not only pay interest on the bonds, but pay one hundred thousand dollars a year as tribute to the city treasury, besides furnishing such liberal dividends on the stock that the shares are already worth three times their par value. Perhaps the gains of an underground road might not be quite as large, but if a surface line can earn a profit of three or four hundred per cent a year, there should not be much difficulty in inducing investors in open market to furnish all the capital required. The work on the Hudson River Tunnel is also said to be languishing for want of funds in the same inexplicable way. With the commerce of a continent waiting on the New Jersey shore for the completion of the tunnel, the death of one man, Mr. Trenor W. Park, is said to have paralyzed this enterprise, while millions are being cheerfully subscribed to cut or build three waterways across Central America, the traffic through all of which in a week would probably not equal that which would pass through the Hudson tunnel in a day.

A STARTLING report comes from Chicago, to the effect that the water of Lake Michigan has been discovered to be rising at the rate of four inches a year. It seems hardly possible that this estimate can be correct, but a record is said to have been kept which shows that the surface of the lake is now two feet and a half higher than it was seven years ago, and the lake shore drive in Lincoln Park, which was originally well above water, has been so encroached upon during recent storms that about half a mile of it is now impassable. No explanation of this singular phenomenon, so far as we know, has yet been offered. That it must be a recent movement seems to be evident from the consideration that a change of levels at the rate described would, since the site of Chicago was first known to civilization, have raised the lake more than thirty feet, and would, of course, have entirely transformed the character of the country, but we have, perhaps, to look forward to the probability that the action may continue, or even increase, and the next generation will perhaps see the conformation of the lake shore greatly altered. There is a tradition of a submerged city, existing, we believe, off the coast of Portugal where, according to the story, one can see, in a still day, white walls and towers far below the waves. Although we should not think of desiring such a fate for Chicago, there would be something picturesque, if it were inevitable, in the idea of sailing about over that wonderful city, and setting, perhaps, shad nets across the streets which are now so full of life and animation. There is a remote possibility that it is not the lake bottom that has risen, but that the layer of floating hardpan on which the city is built is slowly settling, through being over-weighted by recent building operations.

IT would seem to one, unacquainted with American jurisprudence, a little singular that a man who had been lately convicted of manslaughter, and sentenced to a long term of imprisonment, for building houses that would not hold themselves

up, should still be distinguishing himself by the erection of more houses of the same kind; but the mercy of a New York judge toward suitable persons knows no limit, and Mr. Charles Buddensiek, whose condemnation to a term of years in the penetentiary formed the sensation of the daily papers a few months ago, was, it seems, liberated on bail immediately after his sentence, and is employing his time in constructing rows of infirm houses with an energy that would be commendable, if it were not also attended with danger to other people. A few days ago some children were so incautious as to play tag in the vicinity of one of his newly-built blocks. Perhaps they were unable to modulate their voices to the tone adapted to the nervous systems of these delicately-organized structures, or perhaps, indeed, one of them may have laid a rash hand on the wall. At all events, the rear of the house at the end of the block suddenly fell outward, right upon the group of boys, burying three or four of them under heaps of brick and mortar. One of the boys had three ribs broken, and suffered also a severe blow on the head, and will probably die, and two others were carried, covered with blood, to a hospital near by, where their wounds were dressed and they were sent home, cut and bruised.

WE find in *La Semaine des Constructeurs* an account of the construction of the Venetian rain-water cisterns, which may contain a hint for those who have to devise cheap appliances of the kind in regions where bricks and cement are costly. The soil of Venice being a soft, sandy mud, the excavation of a pit with vertical walls necessitates staying and bracing, so the cisterns are usually made in the form of an inverted square pyramid, the sides inclining at an angle of forty-five degrees with the vertical. The slopes are nicely formed, and planks are then laid over them, to protect them from injury while the lining is being laid. The lining is composed of clay, well mixed and tempered, which is put on in a layer about a foot thick. The workman begins by placing a considerable body of clay in the apex of the pyramid, beating it well down, and placing on it a stone, generally of granite, cut to a level on top, and with a circular basin-shaped hollow formed in the middle. Around this hollow is built a circular wall of brick, four inches thick, the three lower courses of brick being moulded with small holes through them. After the brick shaft has been carried up a few courses, more clay is brought and filled in around the stone, sloping slightly toward it, so that the hollow centre of the stone forms the lowest point of the cistern, and the water can be drawn, almost to the last drop, by means of a bucket let down through the shaft. We should, of course, use a pump instead of a bucket, but at the time when most Venetian appliances for housekeeping were invented, there were few pumps, and a bucket, dipping from a hollow stone of a quality hard enough not to be worn away by the contact of the wood, suited the circumstances very well. As fast as the walls of the shaft go up, the clay lining of the pit is built, or rather, is laid, the workman taking up balls of soft clay, working them a moment in his hands, and throwing them against the bank. After getting the material roughly into place in this way, he pounds it with sticks, and works it into a smooth surface, and when both cistern and shaft-walls have progressed to a certain height, he fills the space between with clean sand. This process is continued until the sand reaches the surface. Four little pits are then formed in the sand, with channels of communication between them, and all lined with brick, which, in the channels, is laid dry, with rather open joints, and the surface is covered with flagstones, having gratings over the pits. The flagging slopes toward the outer corners, at which the pits are placed, so that the water falling on the surface runs into them, and any sediment collects at the bottom, just as in the catch-basins of a road-drain. The clear water, which overflows from the catch-basins, runs along the channels of communication, under the flagging, and soaks away through the open joints into the sand, through which it filters slowly, reaching at last the bottom of the cistern, from which it passes through the perforated bricks into the shaft, which is built up above the flagging, and furnished with a curb, like a well. The process of filtration is slow, the draught of a few hours in the morning exhausting the water accumulated in the shaft through the previous night, but the quality of the water is excellent, and the whole arrangement is well adapted for keeping clean with little trouble or expense.

A GOOD deal of archæological information is as usual to be found in the *Builder.* According to this, the curious investigations undertaken by the French expedition at Delos have been continued, or rather, recommenced, and many small articles of interest discovered. Some two hundred fragments of inscriptions dating from the fifth to the first century B. C., have been found, besides many bits of terra-cotta and bronze. In Germany, which, although a wilderness inhabited by savages in the time of the Romans, has, through the habit common among the Roman generals, of carrying an immense amount of household furniture with them on their campaigns, yielded a remarkable variety of small objects of antique art, a bronze statue of Victory has been found buried within the inclosure of the Roman fortified camp at Bonn, and with the statue was discovered a splendid gold medallion set with rubies. Every one remembers the story of Clovis and the vase of Soissons, and it is probable that the wars of the Dark Ages in Central Europe changed the ownership of many beautiful and precious things which are yet to be discovered in the country about the Rhine.

AN important operation is going on systematically at Winchester, in England, where, by the coöperation of the Dean and Chapter, and the people of the town, extensive excavations are being made around the Cathedral. Historically, Winchester is one of the most interesting Cathedrals in England, having been connected in some way with the lives of nearly all the later Saxon and earlier Norman kings, and the documents relating to it are almost innumerable. Partly, perhaps, on account of its importance in this respect, the building itself has been the object of an immense amount of remodelling and rebuilding, so that the superstructure is now nearly all of the Perpendicular character, which William of Wykeham, the last man who attempted to improve it, gave to it. It has long been noticed, however, that the surface of the soil about the Cathedral had risen, so as to cover the earlier plinth and water-table, and there seemed to be every reason to believe that much of the Norman work would be found untouched below ground. The depression of industry in England within the last few years made the commencement of works of excavation a charity, and a good deal has already been accomplished for humanity as well as for archæology by means of the undertaking. According to the records, two churches once stood side by side at Winchester. The earlier one is known to have been planned by King Alfred the Great, and after its completion, by his son King Edward the Elder, the remains of Alfred and Queen Alswitha were buried in the church. One hundred and sixty years later the Normans took possession of England, and Alfred's church was soon afterwards taken down and removed, piece by piece, to the outskirts of the town, while the Norman bishop, Walkelyn, undertook the reconstruction and remodelling of the ancient convent church which stood close by, and which has continued to this day to be the most important Cathedral, with one or two exceptions, in Great Britain. The present Dean, knowing that Alfred's church had occupied some portion of what is now the Cathedral enclosure, removed the earth over a large space to a depth of about four feet, and, in addition, cut several trenches northward from the present Cathedral wall. He was rewarded by finding, at a distance of about twenty-six feet from the present building, a massive foundation wall, which was uncovered for a length of about eighty feet eastward, in a line parallel with the Cathedral wall, and seems to be undoubtedly the substructure of Alfred's church. The masonry is evidently of Saxon date, great quantities of the flat Roman brick being built into it, and a large number of Roman coins and pieces of pottery have been found in the excavation. So far, only the south line, and a portion of that towards the west, have been uncovered, but it is intended to lay the whole outline of the church bare. Around the present cathedral the excavation has been carried to a depth of four feet, exposing the plinth, which is in perfect condition, and of early Norman character. A small Norman doorway in the west wall of the north transept has been uncovered, which seems, from the documents, to have been the private entrance by which the king entered the church from his palace, which is known to have stood very near that part of the Cathedral. The crypt, which was at some period intentionally filled with three or four feet of earth, is also being cleared out, and a great improvement is said to have been effected in the appearance both of the crypt and the exterior of the building.

MURAL PAINTING.[1] — IX.

DURABILITY OF FRESCO.—ITS PRESENT POSSIBILITIES.—FRESCO COMPARED WITH WAX-PAINTING.—FRESCO-SECCO.



Philosophy by Raphael (Vatican).

A COMPARATIVE study of the various fresco methods would be utterly barren had it no practical import. Were it not pregnant with fruitful lessons, it would be well to leave such an examination to archæologists, and men of letters. I have been obliged now and then most unwillingly to trespass on their preserves. The history and criticism of art as understood to-day has too wide a range for a single mind. Its different epochs and various applications call for specialists. When the doctors have disagreed on subjects pertaining to my craft, I have merely applied a painter's instinct and experience to form a personal opinion. A great deal has been written about the Pompeian frescos, but none have written more convincingly than Donner and Cros, both painters. Though, as I have before remarked, there is something positively marvelous about the preservation of these paintings, yet we are forced to accept the conclusions of such practical men—at least for the present—that they are frescos. Pompeii was buried to the depth of a little more than sixteen feet by the eruption of Vesuvius (A. D., 79), the lower thirteen feet being composed of pumice, the remainder of fine ashes. Subsequent eruptions added their quota of volcanic matter, which was finally covered by about two feet of vegetable mould, in all from twenty to twenty-four feet. Though the water might quickly percolate through the ashes and sand, yet the paintings must have been thoroughly drenched after every heavy rain, and we cannot attribute their preservation to the nature of the soil; for any such hypothesis would be shattered by the equally wonderful preservation of the Farnesina frescos (as I am told by a competent eye-witness) discovered in 1879, that have lain imbedded for centuries in the deposits of the "yellow" Tiber. The much older fragments of painted plaster recently found in the pre-historic palace of Tiryns have not fared so well. Those on the walls which were most exposed to the action of water filtering through the superjacent soil are the least well preserved. Other detached fragments found among the débris on the floors are less injured, and of these the bits that were found face downwards, and consequently more efficiently protected from the effects of water, are the freshest of all. It is to be regretted that Schliemann and Dörpfeld do not develop their reasons for believing these paintings to be frescos — the one reason given being somewhat insufficient—but accepting them to be such, we can readily account for their comparative decay, when we are told that the walls were first covered with clay, and then plastered [no analysis of the plastering is given].[2] Light tends to fade fresco colors, and the absence of it has undoubtedly contributed to the preservation of ancient pictures. The paintings left *in situ* at Pompeii are rapidly disappearing; but this is not a fair test, as it is well known that fresco can neither withstand the attacks of sun nor atmospheric corrosion. Those that were removed to the Museum at Naples have not deteriorated. The durability of the ancient frescos must be chiefly ascribed to the excellence of the plastering; and their relative degree of soundness is apparently in direct ratio to its solidity. This is further corroborated by the relative condition of the Italian Renaissance frescos. Though these may be superior artistically to extant ancient frescos, they have deteriorated more rapidly. Neither Donner nor Cros find any signs of pouncing or point-tracing in the mural figure-work of the ancients, a fact that accounts for the many faulty proportions. The Pompeian painters worked freely and drew carelessly, notwithstanding the mechanical excellence of their methods. In this respect they resembled the Byzantine artists who also drew from inspiration without preparatory cartoons. But the latter carefully established the proportions of their figures with the compass, attempted much less, and were thoroughly versed in conventional expression. There is a great difference in the present condition of the Italian frescos. There decay is not proportional to their years. Some of the earliest by Giotto [1276–1337] and his school are much sounder than others painted several centuries later. It must not be supposed that all old plaster is good. Croaking fanatics too frequently fall into such errors. As a matter of fact the Italians were careless plasterers. They took care that the lime was thoroughly slaked—an example we might follow with profit—but they often applied it to the wall in the rudest fashion, as uneven and broken surfaces testify. The Venetians were notably negligent in this respect, much more so than the Tuscans, who were not always over-careful. There are instances where the former applied the *intonaco*, or painting-coat, directly to the wall, without the interposition of a preparatory rough coat (*arriccio*): of course such plaster and the paintings thereon were short-lived. The ancients did not economize the plasterer's labor, and as a result their paintings have stood admirably. If we may judge from the tone of Cennini's book, Giotto and his followers were painstaking and lavish of labor. The relative soundness of their work corroborates this view. Moreover the thinly-painted frescos have generally outlived those painted with more body. In some instances frescos have perished because they were not entirely "*buon-fresco*," but a compound of fresco and distemper. In the Loggie of the Vatican, Giovanni da Udine (1494–1564), pretended to imitate the plastering of the ancients, as revealed by the frescos in the recently-discovered Baths of Titus; but his failure to comply with all their laborious conditions compromised his paintings. Many instances of sound Renaissance fresco may be found at Siena: among others those in the library of the cathedral by Pinturicchio (1454–1513), which according to my note-book are "wonderfully well-preserved." To-day, apparently, all the ingredients of plaster are equal, perhaps superior, to those of bygone times, but undue haste curtails the length of time necessary for slaking the lime, and economizes the care and labor requisite for a stanch wall-surface. The more one consults the authorities on plaster and cements, the more one is bewildered. They are plethoric with sound advice and sound combinations, which are anything but sound in practice, why, I am not prepared to say. But the unpleasant fact remains that our plaster, which is the only possible ground for fresco, is wretched. It seems to me as though the fresco process might be improved, were some competent chemist to devote himself to the problem. I have lately made a few insufficient experiments, in the hopes of elucidating much that is mysterious, but without any trustworthy results. It was impossible among other difficulties to find lime that had been slaked a year. There is much to be explained about the nature and formation of the crust, the causticity of the lime, the changes it undergoes by keeping, etc., that can only be explained by a chemist.

I can hardly forgive a well-known and usually sympathetic English writer on art for his depressing and unappreciative estimate of fresco, and for his inadequate review of mural painting in general. "Fresco," he says, "ought to be looked upon as a slight and cheap art, to be done without much effort, and without any attempt at elaborate finish."[3] The impressive, beautiful and *highly-finished* frescos of Raphael and Michael Angelo, not to mention others, deemed by many the grandest works of art ever produced, though this is a matter of opinion, sufficiently refute such an unfortunate statement, which, if made by a less reputable personage, would be suffered to pass unnoticed.[4] Many of my readers are doubtless aware of the efforts made to revive mural painting in England about 1841. The

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[1] Continued from page 141, No. 534.

[2] At the Boston Museum of Fine Arts there are some fragments of colored wall-plaster from Assos. The largest piece is about two inches thick, but does not represent the entire thickness of the plaster. It is composed of three clearly-defined coats. So much of the first has been detached that its original thickness cannot be determined. Curiously enough it is made of lime and chopped straw, as was recommended hundreds of years later by the monk Denys, and as practised to-day by the Athonite frescoers. The second coat is a mixture of coarse sand and lime, grayish in tone. It is six-tenths of an inch thick. The third, or superficial coat, two-tenths of an inch thick, is composed of lime and a finer quality of sand, and is much whiter than the preceding coat. On this third coat is spread a color resembling vermilion, pale and dirty when dry, but brilliant and fresh when wet. It is applied "*a buon-fresco*." The plaster is rather friable.

[3] The term "finish" should not be confounded with elaboration. The best Italian frescos were thoroughly finished, though not elaborate. Elaboration is possible in fresco, but it is not wanted.

[4] To illustrate the impressiveness of Michael Angelo's frescos, injured as they are by time and more particularly by man, I quote a few red-hot notes, jotted down in 1878, after one of my periodical visits to the Sistine Chapel. It is scarcely necessary to apologize for their informality. "Capital place to compare the genius of Michael Angelo with that of his immediate predecessors. His vault completely kills all below it; and the longer one looks the more the killing process goes on. Indeed I found it very difficult to pay any attention to the Pre-raphaelites. Often as I go to the chapel, I am always captivated by some new beauty. To-day by the delightful tone of the vault. It is infinitely more decorative than the frescos on the walls by the precursors, notwithstanding their profuse use of gold. To-day, too, I was overcome by the grand 'Creation of the Sun and Moon,' massive, eternal figures moving like the whirlwind. I noted also a fine, pensive, seated female figure in the 'History of the Virgin.' The Signorellis, Botticellis, etc., seem like pigmies as compared with Buonarroti. Yet they are interesting. The serried ranks of Ghirlandajo; the stiff and clumsy attempts of Botticelli to express action, the glimmerings of the antique in Signorelli, the importance of space recognized by Perugino," and so on.

Symonds in his "*Renaissance*" (1879), most sympathetically apprehends and describes the beauty, nobility and poetry of this inspired vault. "There is no luxury of decorative art, no gold, no paint-box of vermilion or emerald green, has been lavished here. Sombre and aerial, like shapes condensed from vapor, or dreams begotten by Ixion upon mists of eve or dawn, the phantoms evoked by the sculptor throng that space. . . . The grace of coloring, realized in some of those youthful and athletic forms is such as no copy can represent. Every posture of beauty and of strength, simple or strained, that it is possible for men to assume has been depicted here. Yet the whole is governed by a strict sense of sobriety. The restlessness of Correggio, the violent attitudinizing of Tintoretto, belong alike to another and less noble spirit. To speak adequately of these form-poems would be quite impossible."

attempts at "*buon-fresco*" were failures.[1] The English [delightful poets !] have always been singularly deficient in those masterly technical powers—the birthright of the Latin races—which are essential to the execution of imposing mural compositions; though here and there a foreign-trained painter may have proved himself an exception to the rule. Fresco is no medium for the feeble, or for those who cultivate a certain dilettanteism of execution. It exacts a virile and spontaneous handling, and experience allied with consummate skill. It is not a tentative or hap-hazard art, if the cartoons are properly prepared, and provided the painter knows his business. Its very limitations are in a way advantageous, and lend strength and fire, just as the limitations imposed by time and weather stimulate the sketcher; with this difference in favor of the mural painter, that his drawing and color have been prepared beforehand. He may paint much or little at a sitting, only that much or little must be completed. It is of course a disadvantage to paint piece-meal, but then all mural painting has to be conducted on a piece-meal basis, though less than in "*buon-fresco*." Because there may be a lack of practitioners, it would be unjust and ill-advised to condemn and discard a noble art, and that not a lost one; for I have seen charming frescos in Italy executed by contemporaries, less grand in conception than those of the Renaissance, but apparently as well painted. A great deal was said and written at the time about the unsuitability of fresco to "British genius," and to British climate. The truth is that British genius was unsuited to "*buon-fresco*." Several foreigners have since executed



The Erythræen Sibyl, by Micheel Angelo.

successful, and thus far, durable frescos in London. The esteem in which fresco was held by the painters of the fifteenth century may be gathered from the recently-published letter of Francesco della Cossa to Francesco Gonzaga.

"Much honored prince; very noble lord. . . . It seemed to me strange that my work should be paid at the same rate as that of the others, who have neither spent the time nor the money that I have. I tell you this, my lord, because I have always painted in fresco, which, as every master of art knows, *is one of the most advantageous and best methods of working*. . . .

"Your noble lordship's most humble servant,"

"Francesco della Cossa."[2]

The somewhat restricted palette imposed by fresco is very much in its favor, and yet it is far from meagre, as has been already shown. Its light, simple, quiet tones are eminently adapted to mural decoration, which ought not to affect realistic relief. It gives a dead surface, which is the *sine qua non* of wall pictures. All dark, dead-colors are less deep, or black, than the same colors when varnished. But as gloss and depth of tone are just what it is necessary to avoid in mural painting, it is an advantage to be deprived of them.[3]

[1] One of the artists who "had nearly been driven mad by the trouble and annoyance which the old system of fresco caused him," and who abandoned it for another process, in a letter addressed to Lord Elcho, says that "Fresco may do admirably well where a slight bravura sort of art is required, but this should be the *passe-temps* for those whose aim is very moderate and whose employers are easily satisfied. Fresco has had a fair trial here, and is to give way before something a thousand times better in every way." [!!!]

[2] "Ferrara, 25 March, 1470." From the French translation in the *Gazette des Beaux Arts*, December, 18 5.

[3] An exception to this rule will be noted in paper X.

Though both are void of gloss, there is a difference of tone between fresco and distemper. The former seems lively and transparent when compared with the deadness and opacity of the latter, though by no means thin. On a bit of plaster before me there is some yellow ochre applied when the plaster was wet, in the fresco manner. By the side of it is more of the same pigment applied to the same plaster when dry. The difference of tone between the two is considerable, the former being yellower and brighter than the latter. Moreover, "*Alla prima*" methods — final methods without retouchings — naturally yield fresher and franker tones than more laborious methods, unless the painter applies the latter with great precision, and as nearly "*alla prima*" as possible.

Fresco may be employed for humbler purposes than figure compositions. There is probably no more perishable and common medium than distemper ("kalsomine" is the high-sounding name now in vogue). Distemper, as used by the ancient and mediæval painters for their wall and easel pictures, frequently protected by a coat of wax, varnish or oil, was a very different thing from the unprotected distemper used to-day for tinting walls or ceilings, and too frequently for decorating them. As the colors are soluble in water, it is ruined by contact with moisture, either on its face or from behind. It is liable to peel if applied in more than one coat, or with too much size, and is easily defaced by friction. A slight abrasion exposes the underlying plaster. Altogether it is "poor stuff." A plain tone, ornamented, if desired, with a simple pattern that would not require more than a day for its transference to the side of a room or space to be decorated, might be applied to the wet plaster without the necessity of the troublesome joinings demanded by elaborate ornament. What could be simpler? Water is the only medium. The colors must be suitable to fresco, and these are the cheapest and best. While for important works it is essential to keep the lime for at least a year, as no risk should be incurred, it is probable that a month, or even less, would suffice for inexpensive flat tones, though of course the longer the better. Walls tinted in this way would be more pleasing and durable than with the lifeless "kalsomine." They would not, perhaps, bear the friction of oil-painted walls, but would be less likely to change color, and would, moreover, be far cheaper. That the required tone must be determined before the plastering is finished might be deemed an objection; though to some people any imaginative brain-work is irksome. A more serious difficulty would be to protect the frescoed walls from the subsequent operations of careless workmen. The best of all plans for tinting plaster walls is to mix the pigments with the plaster before its application. This guarantees the colors from disfigurements caused by blows or abrasions. The pattern could be added while the plaster is still wet. It is not possible to spread a perfectly flat tone over large surfaces in this way, for the differences in handling of the several workmen cause differences in tone, though all use the same plaster. As walls are rarely void of ornament, either fixed or movable, such inequalities would not be objectionable. But it is almost impossible to make the average house-painter understand that the very qualities he is working for with might and main are precisely those that are most offensive to the artist, and one of these is a dreary opaque flatness.

When the relative merits of fresco and wax-painting are compared, the present state of things must be taken into consideration. In the choice of a medium the painter is guided by actualities rather than by potentialities. If for very cogent reasons he is forced rather than persuaded into the use of the wax medium, let us not on that account slight a noble and beautiful method. Without experience fresco is a most difficult process; but as to that, so are all processes, though fresco is a little more difficult than the others at first. A demand for frescos would certainly create the supply. Any painter gifted with the decorative qualities and trained to mural work could master the perplexities of fresco in a few months. What these decorative qualities are will be indicated in the final paper. However skilful a painter may be in other departments, unless he is gifted with them by nature, and has developed them by training, he should never touch the wall. It is to be hoped that architects — for, owing to its nature, the initiative must be taken by the architects — may some day be pleased to utilize a process so thoroughly architectural as fresco.

There are obviously many places, especially in completed buildings, where the nature of the ground would preclude the use of "*buon fresco*," unplastered stone, for example, cement, wood, or any surface where the use of plaster might not be desirable. Ordinary lath and plaster, unless specially prepared, would be a poor recipient for fresco. It was shown in paper IV that, with proper precautions, wax-painting might be applied to any surface: to stone, by first treating it to a hydrofuge; to plaster, by saturating it with the medium. Even when the plaster has cracked, or is disposed to crack, wax painting is perfectly safe, if canvas be applied to the wall in the manner already explained. This will bridge over the existing cracks and prevent their further development — always provided the space to be decorated is not very large, since expense might otherwise preclude its use. But where the conditions are favorable, and expense is not an object, the application of canvas is recommended as the best and safest ground. It would be wearisome to recapitulate the durable qualities of wax-painting. They have been fully developed elsewhere. Its simplicity, too, has been proved. In certain respects it is more simple than fresco, in others, less so; it is quite as simple as oil, and a good deal simpler than "spirit-fresco." Simplicity is of

the greatest importance to the painter, whose means of expression should be facile if he ever hopes to be eloquent. In common with fresco, wax-painting has light, airy tones, and a dead surface. It may be applied semi-transparently, or with the impasto of oil-painting, which it resembles in technique, though free from its decorative defects. It has none of the lifelessness or opacity of distemper. As any color may be mixed with the wax medium its palette is very extended. It has this advantage over fresco, that the first painting is not necessarily a final operation. While it may be used *alla prima* — and the more so the better, seeing that *alla prima* handling has great merits, and that repaintings are liable to engender slovenliness — it may also be retouche l indefinitely, without injury to its quality or durability, as in *buon-fresco*, or without fear of cracks, as in oil. Apparently, wax-painting is the most durable of all pictorial mural processes.

FRESCO-SECCO.

The following garbled extract from Sarsfield Taylor will adequately describe this offshoot from *buon fresco:* "After the general plastering of the wall intended for this process has been finished, and a superior coat of pure lime and sand has been laid over the surface, the whole is then allowed to dry thoroughly. When this wall is found to be in a perfectly dry state, the surface, so far as may be required, is rubbed with pumice-stone, and late on the day previous to that on which the painting is to be commenced the plaster must be carefully washed with water into which a small portion of lime has been infused; next morning the wall must again be washed. After this is completed the cartoon is fastened up, and the outline being pounced, the artist commences his work. The colors used in this method are similar to those employed in true fresco; they are mixed in the same way with water, and the white pigment is lime."

"If, as the operation goes on, the wall should become too dry, a syringe, pierced with many fine holes, is used to moisten it. Painting done in this way will bear washing as well as real fresco, and is equally durable. As regards mere matters of ornament, it is a more certain and ready mode of working than solid fresco; for, owing to the complicated forms of ornaments, it is impossible, in the latter art, to make the joinings at the proper outlines; therefore, merely decorated walls in fresco never are satisfactory to the eye of taste, and this defect is very evident in the Loggia of the Vatican. Another great advantage *fresco-secco* has over *fresco-buono* is, that the former may be quitted and taken up again at any point. We have now shown all its advantages. On the other hand we are bound to say that, except where merely ornamental painting is concerned, it is in every other respect a very inferior art to real fresco; for paintings in secco are always opaque and heavy in their character, differing quite in this essential point from true fresco, which is lightsome, and has much clearness of tone, often a fine transparency. *Fresco-secco*, therefore, cannot be placed in the same elevated rank as *fresco-buono;* indeed, with few exceptions, it has always been in the hands of inferior masters of the later Italian schools, and none of the works of these men in this style have any high reputation. There appears, however, to be an important difference in the durability of the German *fresco-secco* and the Italian of the present day; the former will bear washing, the Italian *fresco-secco* of the present time will wash out, both of which useful facts Professor Wilson ascertained at Munich and Genoa."

Having had no personal experience with *fresco-secco*, I give the above for what it is worth, though much of it is incomprehensible. It seems too good to be true. I have made several experiments in my studio with *fresco-secco*, following the above directions, but without the given results. In every case the color thus applied was washed off by rubbing it with a bristle brush filled with water, though it adhered far more tenaciously than the same color dissolved in pure water and applied to dry plaster. It seems impossible that *fresco-secco* should resist water as effectively as *buon-fresco*. The latter is protected by a thin but strong crust of carbonate of lime, the product of the wet plaster (sand and hydrate of lime) and the air, while the former would only be protected by the very feeble crust of carbonate of lime formed by the air and the weak infusion of lime-water with which the dry plaster (sand and carbonate of lime) has been soaked. The color might be more deeply imbibed by plaster that has been saturated with water than by dry plaster, but its surface would be none the less soluble in water. As to the "impossibility" of adapting *buon-fresco* to the "complicated forms of ornament" I can merely say that I have seen very elaborate ornament executed in this manner. Though *fresco-secco* is in every way inferior to real fresco, it might profitably be used for ornament instead of tempera. No process could be simpler or cheaper.

FREDERIC CROWNINSHIELD.

[To be continued.]

FACADE OF MILAN CATHEDRAL. — The Italian Ministry of Worship and Public Instruction has decided to invite an international competition for the design for the façade of Milan Cathedral. The intention is to select a limited number out of the designs that will be sent in, but not less than fifteen, and the authors will be invited to compete again. There will be a first prize of 40,000 lire (about £1,600), and lesser prizes, which have not yet been determined. The architect who is successful in both competitions will be required to make detailed drawings of his plan of a suitable size before he will be adjudged the winner in the competition. It is expected that the detailed regulations and conditions of the competition will be issued by the department within the next month. — *London Times.*

PICTURES OF THE SEASON IN NEW YORK.[1] — III.



From the Comptoir Nat'l d'Escompte, Paris.[2] Millet, Sculptor.

SO much has been written in the daily papers in all parts of the country about the Morgan Collections and their sale, and the prices they brought, that it may seem hardly necessary that I should recur to the subject here. Yet, since I am professing to give an account of our art-season as a whole, it would certainly not do to omit all mention of its most conspicuous feature.

Never, in truth, in any art-season, was any feature so conspicuous as this has been. Never did any exhibition attract for so long a space such throngs of visitors; never was any so much discussed, not only in those inner circles whose discussions are always likely to turn upon something of the sort, but also in those outer ones — fashionable, Philistine, or humble — which usually take but the most vague and languid interest in artistic happenings. Of course, it was not all a genuine enthusiasm for art; personal gossip, and what I may call trade gossip, were to be credited with much of the verbal commotion, and a large proportion of the visitors to the galleries were evidently most strongly attracted by the non-artistic, the merely costly and showy objects which mingled not inconspicuously with the finer. Moreover, even the great prices paid at the sale are not to be taken as a proof of the truest enthusiasm for the truest values. A comparison of them among themselves checked off by a knowledge of the actual objects for which they were given, goes far to make one confess that the buying public was wildly extravagant rather than wildly enthusiastic. For instance, the Jules Bréton, for which $15,500 was paid, while it was a charming picture, was not one of the artist's greatest; and he himself, though an admirable painter, is not one of the greatest even among the moderns. Again, the market value of the Vibert for which $25,500 was paid is certainly not more than half that sum, while its artistic value, guaged by the truest standards, must be called considerably less than half. It was cleverly painted and beautifully drawn, but bad in color and dependent for its interest wholly upon its "story-telling" quality. This quality was, in truth, of a very remarkable grade. The canvas scarcely needed even its simple title — "The Missionary's Story" — to tell its own tale very distinctly. The old black-robed, scarred and haggard monk spoke as clearly to our ears as to those of his pictured listeners; and each of these listeners — worldly ecclesiastics, dressed in gayly-colored garments and drinking their coffee in a sumptuous interior — was a most admirably realized bit of portraiture. Each was so distinctly characterized that we divined not only his mood of the moment — curiously interested, languidly scornful, callously indifferent — but the whole life and temper which had made this momentary mood inevitable. All of which implied, of course, not only that the painter had painted cleverly, but that he had chosen his subject wisely — with a true instinct for such meanings as can be told in paint without the need of printed explanations. Truly, I say, it was an interesting picture; but all the same it was not within many degrees of being a *great* picture, or one for which so great a price should by rights have been paid. The sum Mr. Vanderbilt gave a few years ago for Millet's "Sower" was hitherto the largest ever paid for a picture in this country. It was almost equalled by that given for this Vibert, and much exceeded by that given for Bréton's "First Communion" — but the fact is not one which we need think we ought to boast of.

There were a number of very good Millets in the collection, including the famous "Gathering Beans," remarkable for its beautiful color, and an unfinished canvas called "The Spaders" which was in his most epic, most impressive vein. The Corots were numerous and some of them extremely fine — the Corcoran Gallery was not extravagant when it paid $15,000 for the large "Wood Gatherers." Among the Duprés was the famous so-called "Symphonie" from the former Faure collection in Paris. The Daubignys were very fine and very various; the Diazes numerous and ranging in quality from good to actually bad; the Troyons very good, but not superlative; the Henners quite superlative; one of the Delacroixs small, but splendid;

[1] Continued from page 104, No. 531.
[2] From the *Moniteur des Architectes.*

the Decamps sober but interesting; some of the Rousseaus as fine as even Rousseaus could be; and a small Fortuny water-color, the most brilliant and charming thing one could possibly behold. These pictures — forming as a whole an excellent representation of the best art of our time — sold for prices which, I am told, should be considered high but not excessive; and which I should say of my own instinct, proved small appropriation of their various degrees of excellence. One or two Meissoniers ran up to higher prices than any among them — and they were not even the very best of Meissoniers. Moreover, a feeling that is nothing short of consternation attacks us when we read of the immense sums paid, I will not say for Bouguereaus — since Bouguereaus, little though they may appeal to some of us, have undoubted artistic value of a certain kind — but for Meyer von Bremens and Verboeckhovens and similar products of an industry whose vogue, we had begun to hope, was forever over in America. That $3,700 should have been paid for a Meyer von Bremen, and over $4,000 for a small Verboeckhoven in which it was hard to divine any attractiveness either of subject or of treatment, and $1,850 for a metallic little landscape of Koek-Koek, while a truly marvellous church interior of Bosboom — the best painter of interiors who has lived during the last century or so — should have gone for $775, a good Jacque for $1,850, and a very splendid Roybet for $2,000 are facts of somewhat depressing import. I do not say that the last-named prices were intrinsically too low, but in comparison with the first-named they certainly do not prove a very nice appreciation of genuine artistic values.

The prints included in the collection I did not see at all. But I am told by a (non-professional) connoisseur that the same unreasonable diversity of prices prevailed when they were sold, the finest things going for sums comparatively — sometimes even actually — low, while modern works that were merely "pretty" or effective, went for much above their market worth. With the books, I believe, it was even worse, the prices scaling in general almost absurdly high. As for the vast array of pottery and porcelain, it contained very little that came within the domain of art save the objects of Oriental origin. Many of these, I believe, were extremely good, but I know too little to speak about them, and I should be rash indeed did I attempt any decisive word with regard to the famous (or should I write notorious?) "Peach-blow" vase. Extraordinary, indeed, and extraordinarily conflicting are the things we have been told about it. It was nominally sold for $18,000, but is said to have been really sold for about a third of that sum, and to have been purchased on its native heath for a poor couple of hundred. One voice will proclaim it the most superlative example of the potter's art on earth, and the next will say its kind is not very good, and it is not very good of its kind. Even its pretty name has been called in question — we must even doubt whether there is such a thing as "peach-blow" ware known to the Chinese amateur. And we are not so much as left in undoubting faith that it has found honorable housing in Mr. Walters's thrice-famous collection. In short, it is useless to try to say aught about it, save that it could not have been worth anything like the tremendous price which was boldly put upon it in advance. Unless, indeed, I may add that to my own private and ignorant eye, it seemed to be worth just about any money which one might be able to find in the very bottom of one's pocket. It did not seem to me more lovely than its companions of less nominal distinction; but each and all of them were the most charming little objects imaginable — beautiful alike in color and in form and in quality of surface.

Another exhibition which was held a little later in the same room attracted scarcely any attention from the general public. We can hardly be surprised at the fact since a reaction from the feverish interest of the foregoing days might naturally have been expected, and since the second exhibition consisted of works from two non-metropolitan galleries — those of Mr. Beriah Wall and Mr. Brown of Providence. Yet it was a fact to be regretted, for many canvasses of great interest were shown. Chief among them were a beautiful Fromentin — better, I think, than any of Mrs. Morgan's; two very fine Daubignys — one a moonrise with pinkish clouds, and another a dark-toned massive landscape called "After the Storm;" a large early Corot of great value as being quite unlike the later works to which we are best accustomed; a fine "Gorge," by Courbet; a splendid early sketch by Millet, with an historical subject — "The Rape of the Sabines;" and a remarkably fine Michel. But scarcely less interesting were a large number of small pictures, studies and sketches by various famous painters—some of them as well-known as Corot, Daubigny, Diaz, Troyon, and Rousseau and Michel, and others as rarely seen on this side of the water as Bonnington, Chardin, Charlet, Gericault, Luminais, Decamps, Delacroix, Fragonard, Latouche, Marilhat, Pils and Vernet. If few of these could be called "important" works, and some of them not even "representative" ones, almost all had a very distinct value, and most of them sold for prices which might have brought them within the reach of those who had had no chance at the Morgan sale. Yet I believe such bidders were few, and the dealers and well-known connoisseurs had things all their own way. One or two excellent American pictures were also included; for example, a brilliant little landscape by Inness, a rather uninteresting head by Hunt, and a river landscape by the same hand, which seemed to me of the greatest charm — delightful in color and atmosphere, and especially in sentiment, though wholly lacking any quality which could possibly come under the title composition.

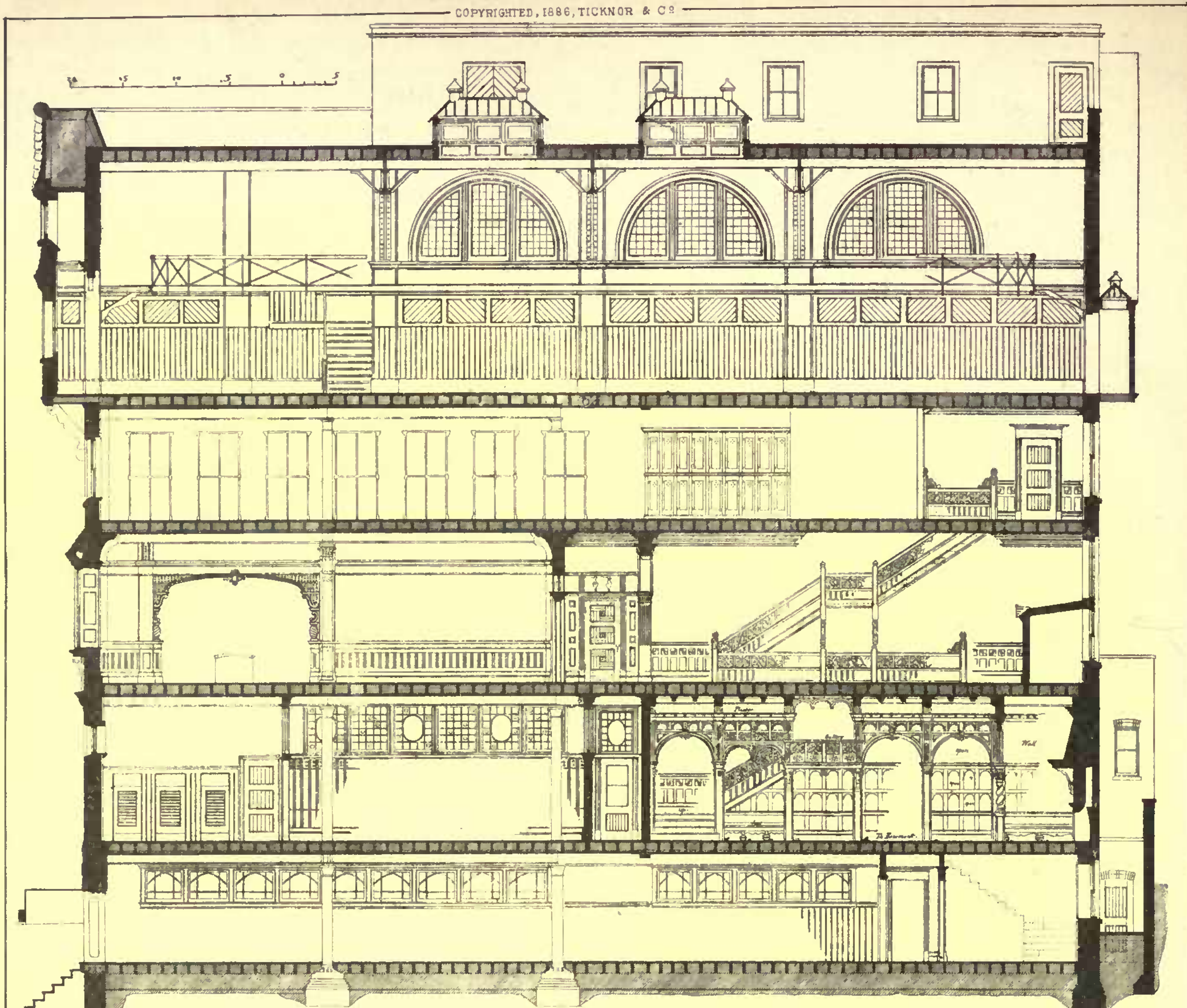
In the days of my extreme youth I conceived a quite peculiar reverence for the collection of Mr. William Aspinwall of this city, partly because it was reputed utterly inaccessible to the public, and partly because it consisted of "old masters," among them, it was said, a very fine Murillo. Between those days and these I had heard nothing whatever of the collection, so it was with much curiosity I heard of its approaching sale, and made my pilgrimage of investigation. It proved somewhat disappointing. To begin with, I did not realize my first definite youthful wish as regarded artistic things — there was no Murillo to be seen. I believe it was sold some time ago in England. Then, although there were famous names enough, but few of the canvasses seemed to deserve their appellations. All the pictures appeared to be genuine in point of age; they were not modern copies or imitations, and some of them were very good works of art. But Rubenses and Lionardos and Van der Helsts and Velasquezes they did not quite appear to be. The full-length portrait of a very young man in a yellow doublet which was marked Velasquez was a very good picture in its way, but so far as I know Velasquez — one cannot really know him who has not been to Spain — it did not seem to show his hand, or, I might better say, any one of his very various hands. I have sometimes heard a rustic critic pronounce a picture a "very handsome" one, and this is just the word which seemed to suit this portrait of a very handsome young fellow. It was hardly very beautiful, and it hardly had those special technical qualities which would rank it as very fine; it was — simply very handsome. The various Cuyps were variously excellent in a way which was hardly Cuyp's. The interesting little interior attributed to Terborg would have been more satisfactory with a less ambitious labelling, while another interior, modestly given to Zoog, was a truly charming and delightful piece of work, wholly characteristic of a great school, if not of one of its greatest members. A genuine Brauwer is a very rare thing to find "in the market" — almost as rare as the skill which transmuted such brutality of subject-matter into such exquisite beauty of technical outcome. It would have been a find indeed had the so-called Brauwer in this collection deserved its name. It was quite a nice little picture, but a good deal below the quality it then would have possessed. On the other hand, a small Van der Velde seemed to deserve its title, and at least certain portions of a Ruysdael — all but the foreground — looked quite as though they might have been painted by so great a hand. As a whole there were many interesting things in the collection, and many which might be instructive to a novice if he had not too implicit faith in their catalogue-titles.

I am not a bibliophile, and only a bibliophile could appreciate, much less describe, the books recently drawn from the library of Mr. Dorman, of Chicago, and put on exhibition here preparatory to their sale at auction. But even a mere art-lover may find much to enjoy in the endless list; — a copy, for instance, of the huge and splendid Napoleonic work on Egypt; one of that great work on Mexican antiquities which ruined its noble author — Kingsborough by name, and Marquis, I think, by station; a fine copy of Claude's "*Liber Veritatis;*" one of the twenty, all that were ever published, of Blake's illustrations to the "*Purgatorio;*" a number of beautiful large missals; delightful bindings of many epochs, and many miscellaneous treasures in the way of "extra-illustrated" volumes.

Exhibitions enough are promised us in the immediate future; the Annual show of the Academy of Design, for example; the second Prize-Fund exhibition; and a collection of works by the Paris "Impressionists," which has been imported, with missionary intentions, by the American Art Association. A slight foretaste of what this last may reveal to us can now be had in Mr. Avery's gallery, and if its average proves up to the few examples here shown, we may anticipate it with great satisfaction. Sisley and Pizzaro, both of whom have been called typical "extremists," are alike more charming and less eccentric than might have been imagined, and Cazin, never called an extremist, and lately admitted to Salon rewards and honors, is very charming indeed, and not eccentric at all. So truthful and so lovely a painting of moonlight as he gives us in his portrait of the village street where he was born it has never been my good fortune to see before by any hand. And certain small landscapes are as simple and unaffected in mood and manner, yet as individual and pleasing as one could ask.

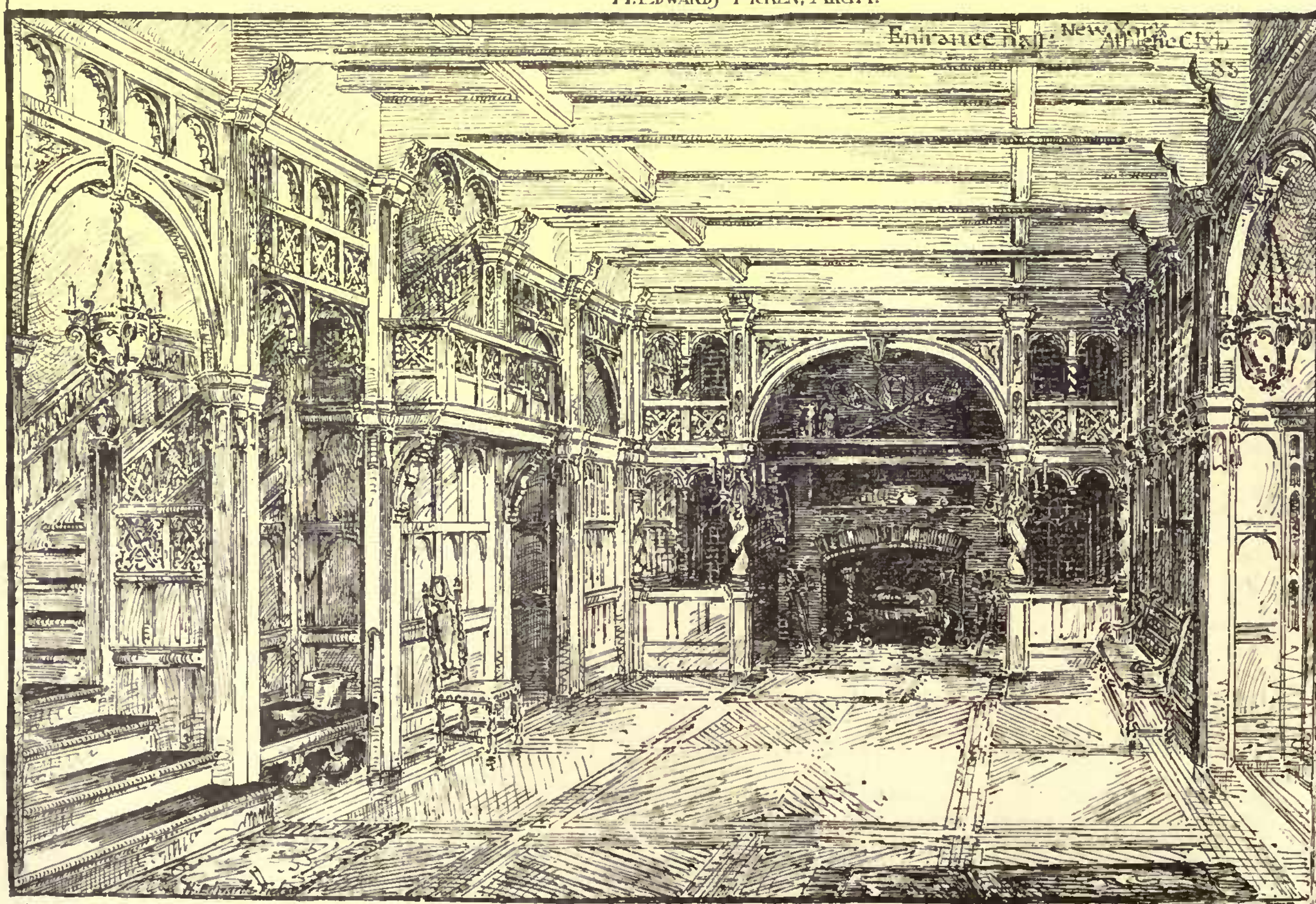
Many persons questioned why a comparatively small canvas called "The Sentinel," by a man not better known to popular fame than Bargue should have brought at the Morgan sale so high a price as $12,000. Partly because the artist is dead, and died young and left very few pictures behind him, and partly because it was an extremely good picture — in Meissonier's vein, but better to many eyes than Meissonier himself could paint. How clever a man in truth was Bargue is shown by a large collection of his drawings recently brought over by Messrs. Reichard & Co. Most of them are small pencil drawings, studies in the truest sense — figures and half-figures and bits of figures many times repeated, with many variations in preparation for his painted work. But the combined strength and delicacy with which they are handled and their singular vitality and meaning, even when they are most fragmentary, give them a high value to any eye which can find the true essentials of art in work that is of so rapid and incomplete a sort. The way in which he posed his figures — making them really *do* that which most figures only seem to do, shows him to have possessed a genuine artist's eye; and still more remarkable is the way in which he proves by the merest fragment of a form that he had had the whole form in his mind while depicting but this part of it. However small the measure of delineation, we always seem to see the rest of the figure, and the suggestion

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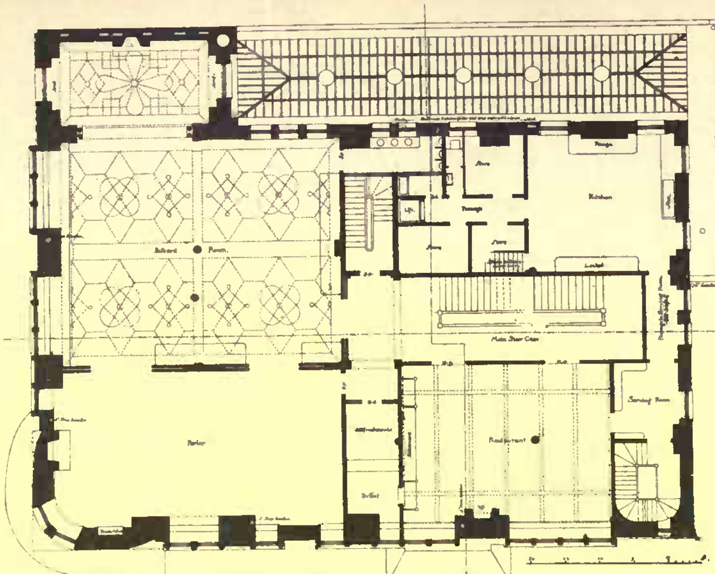
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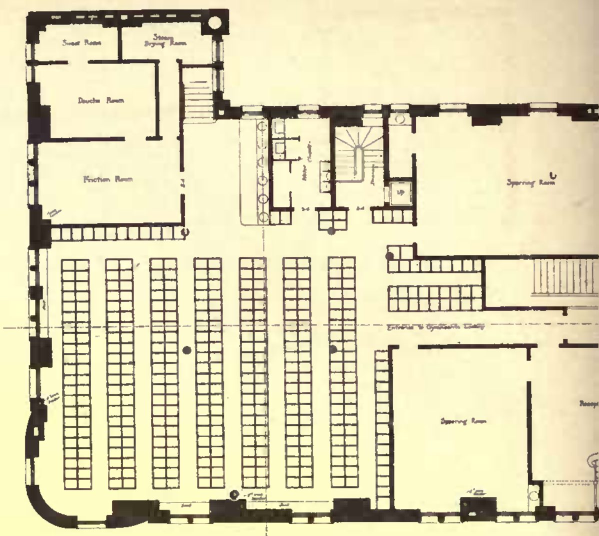
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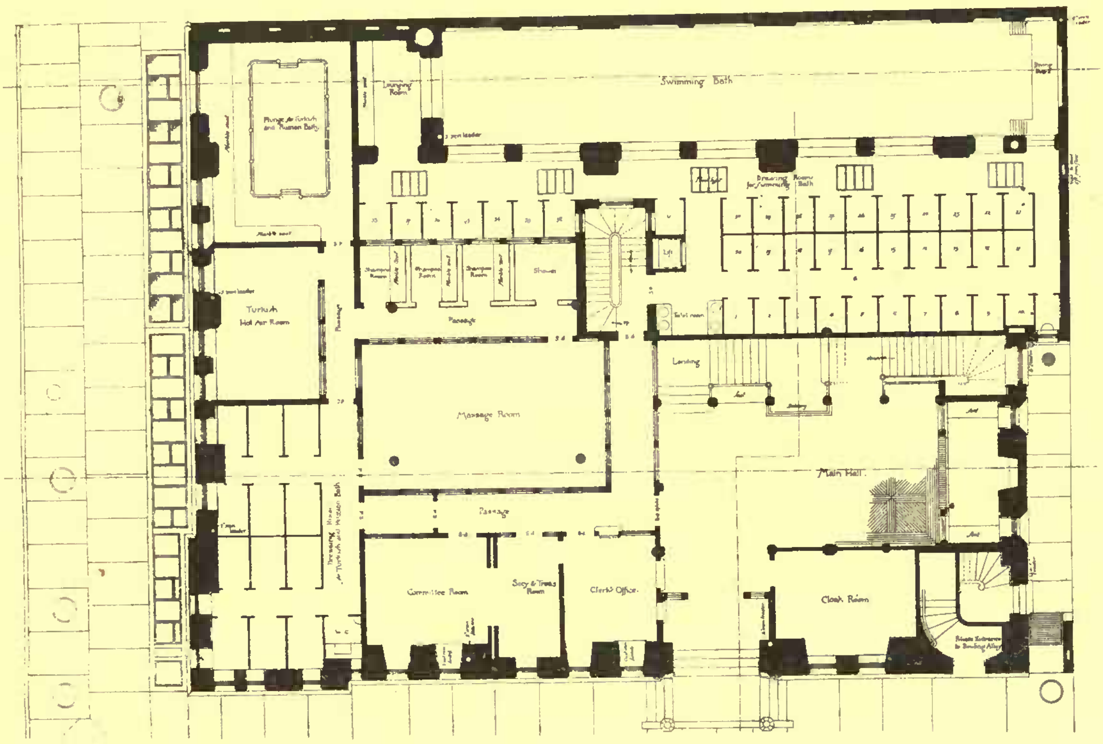


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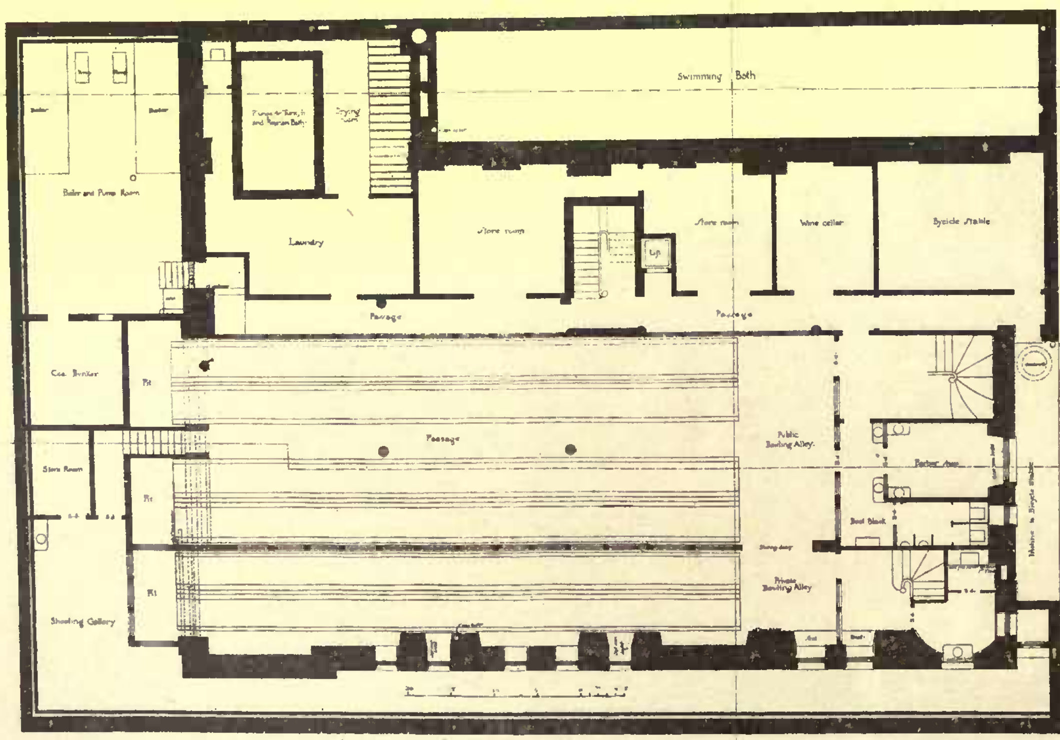
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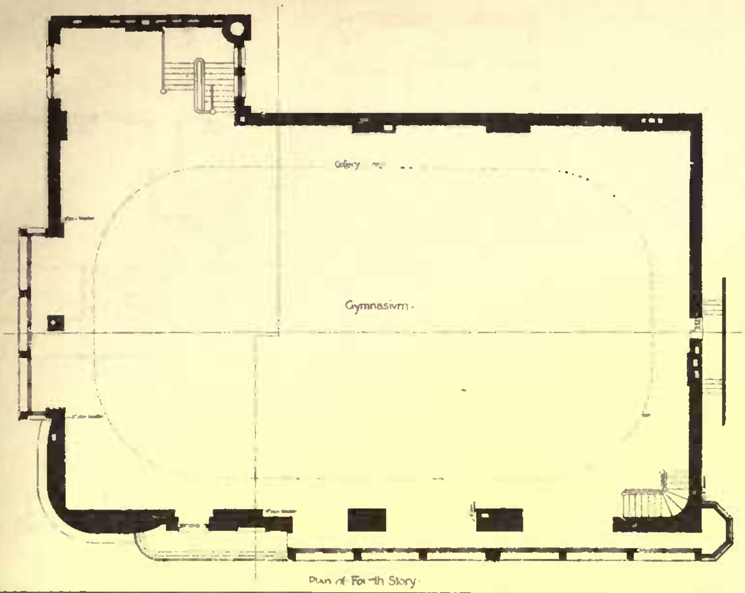


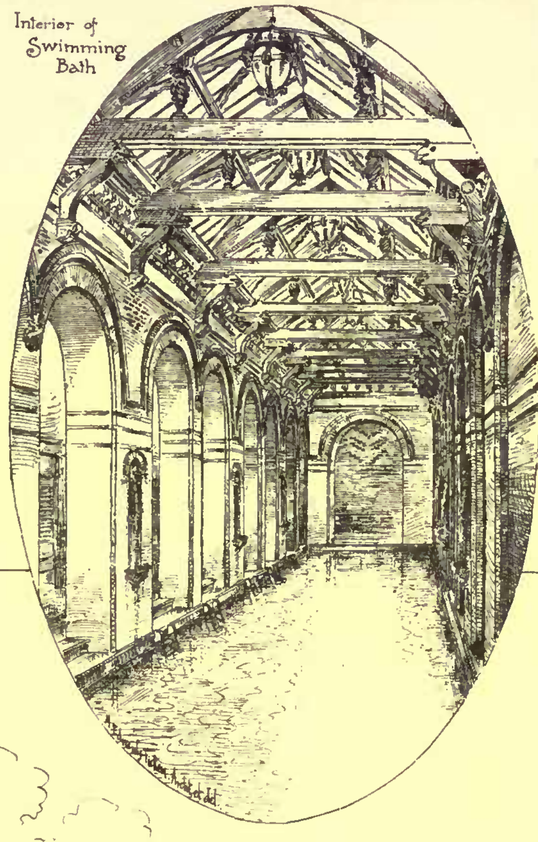




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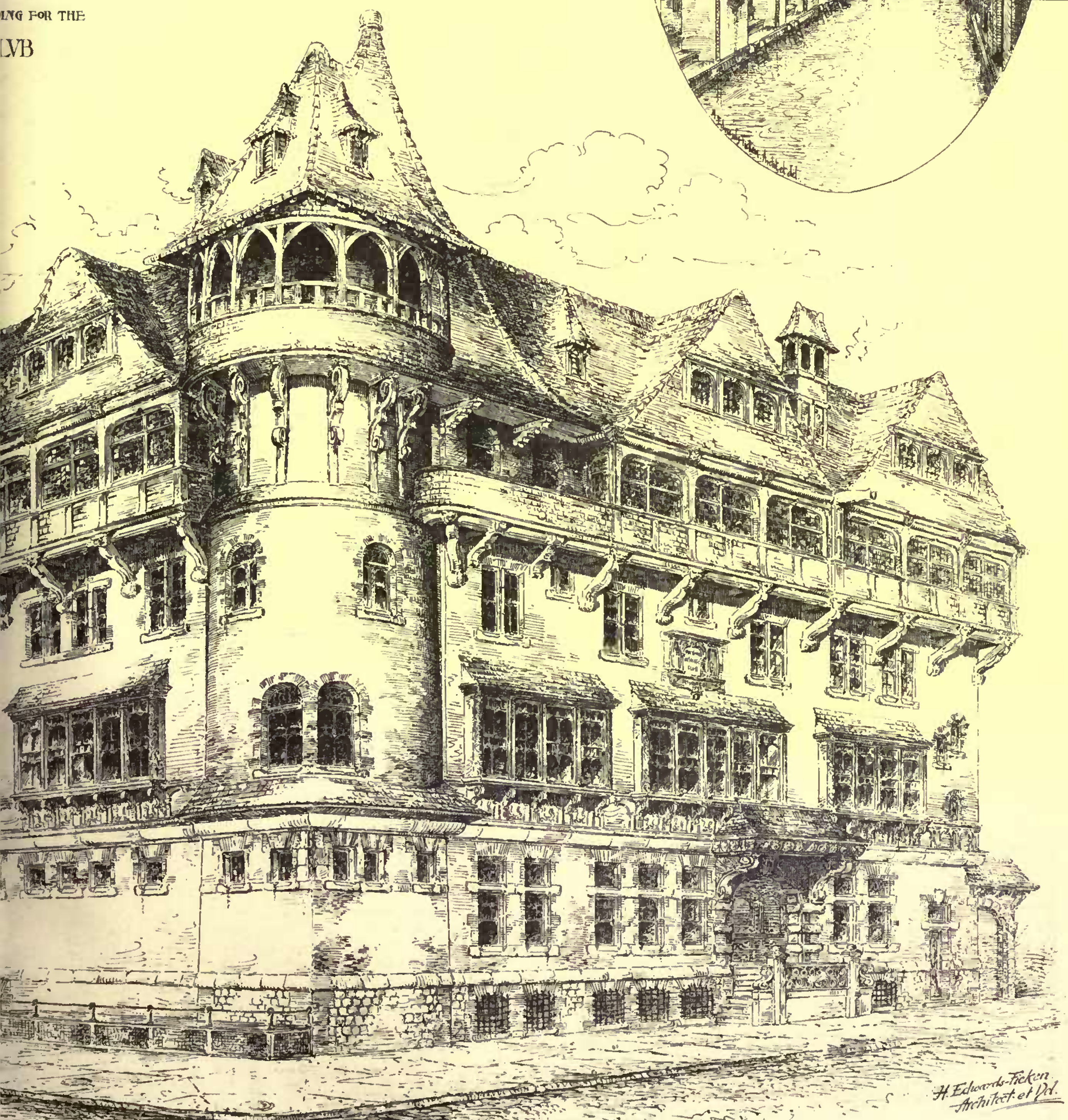
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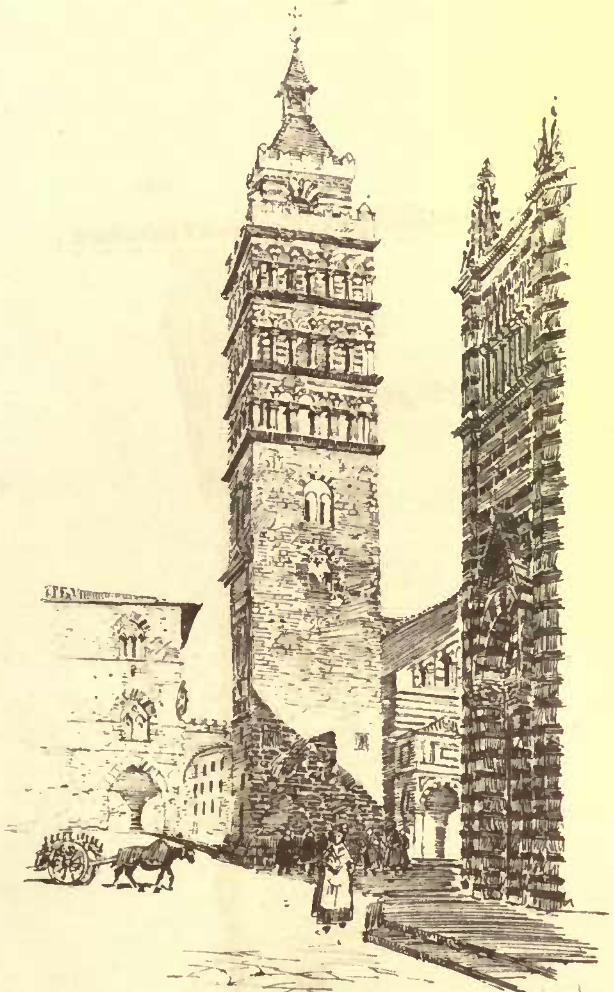
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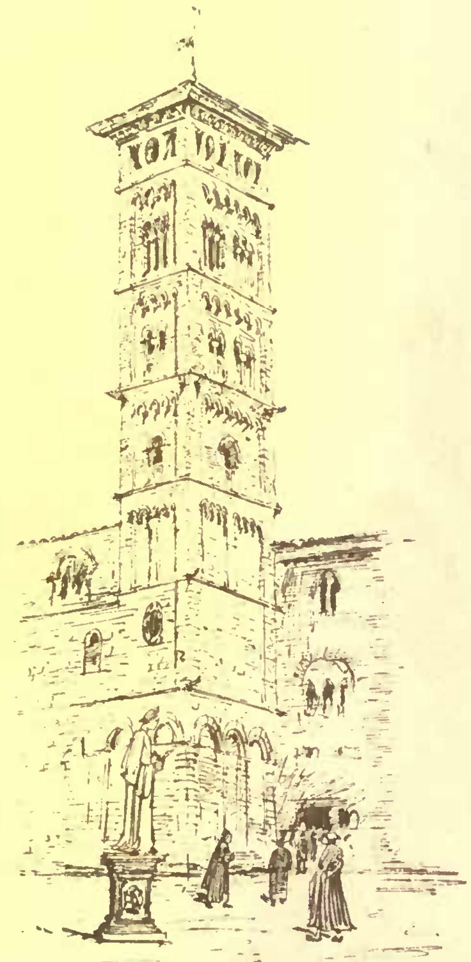
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Campanile of Cathedral - Pistoja

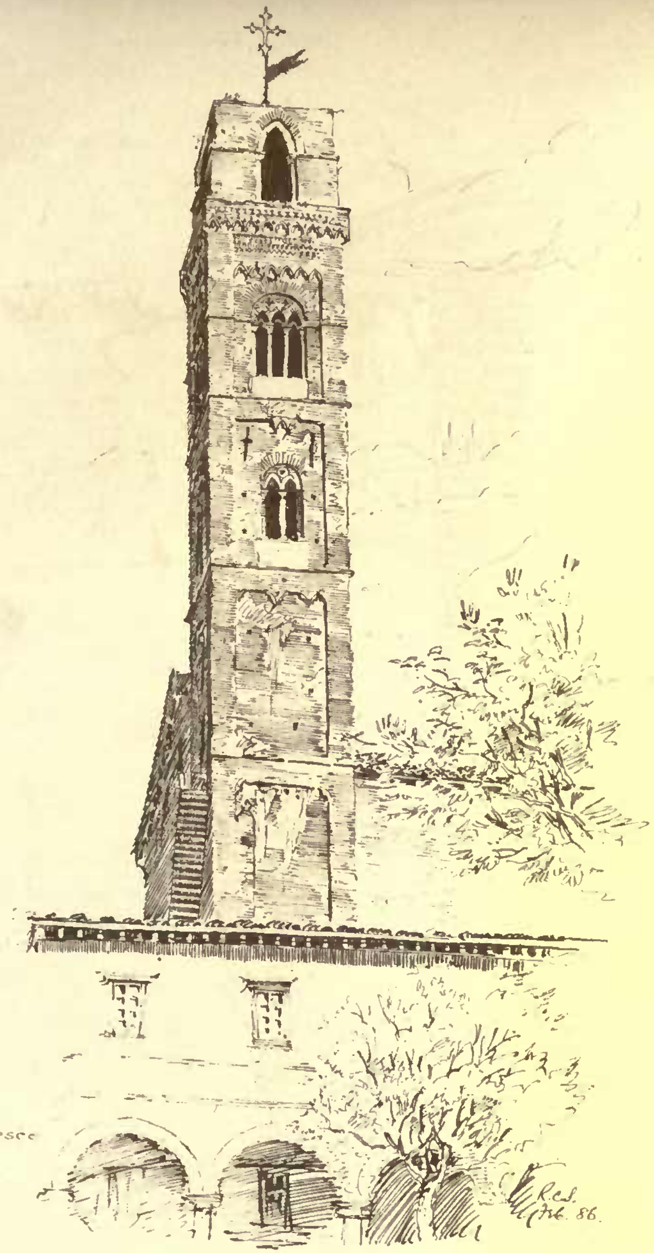


S. Nicolo at Pisa

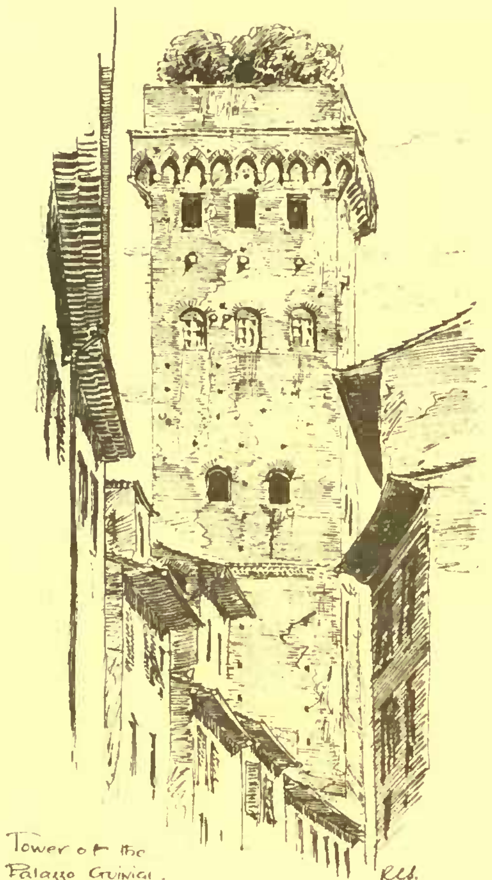


S. Michele Lucca.

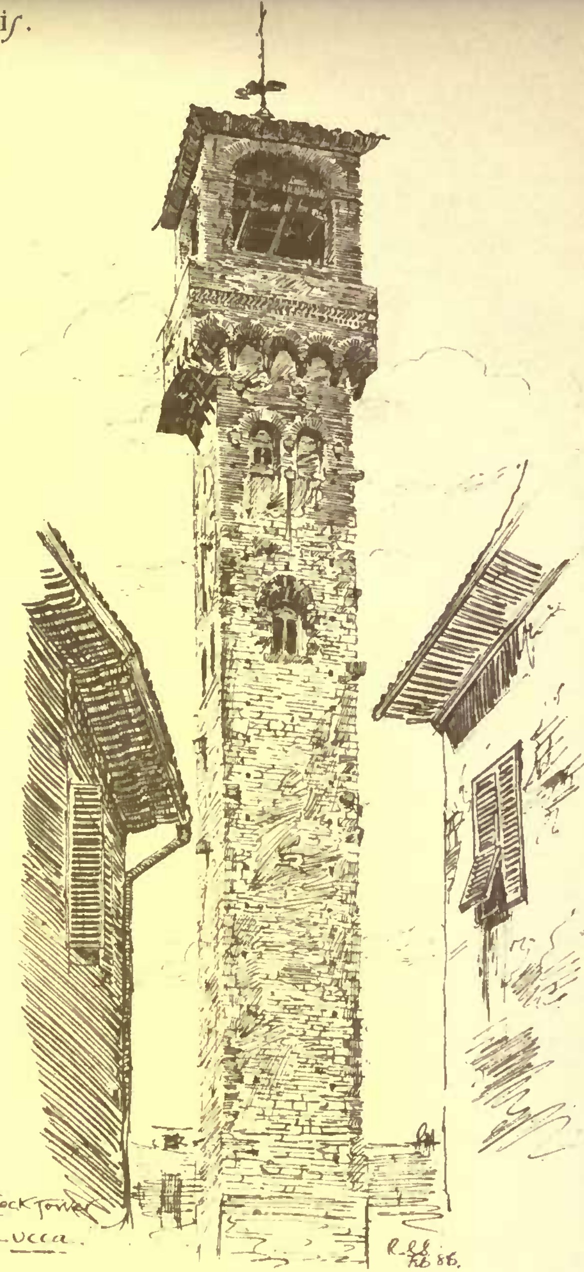
Mr. R. Clipston Sturgis.



S. Francesco
Pisa



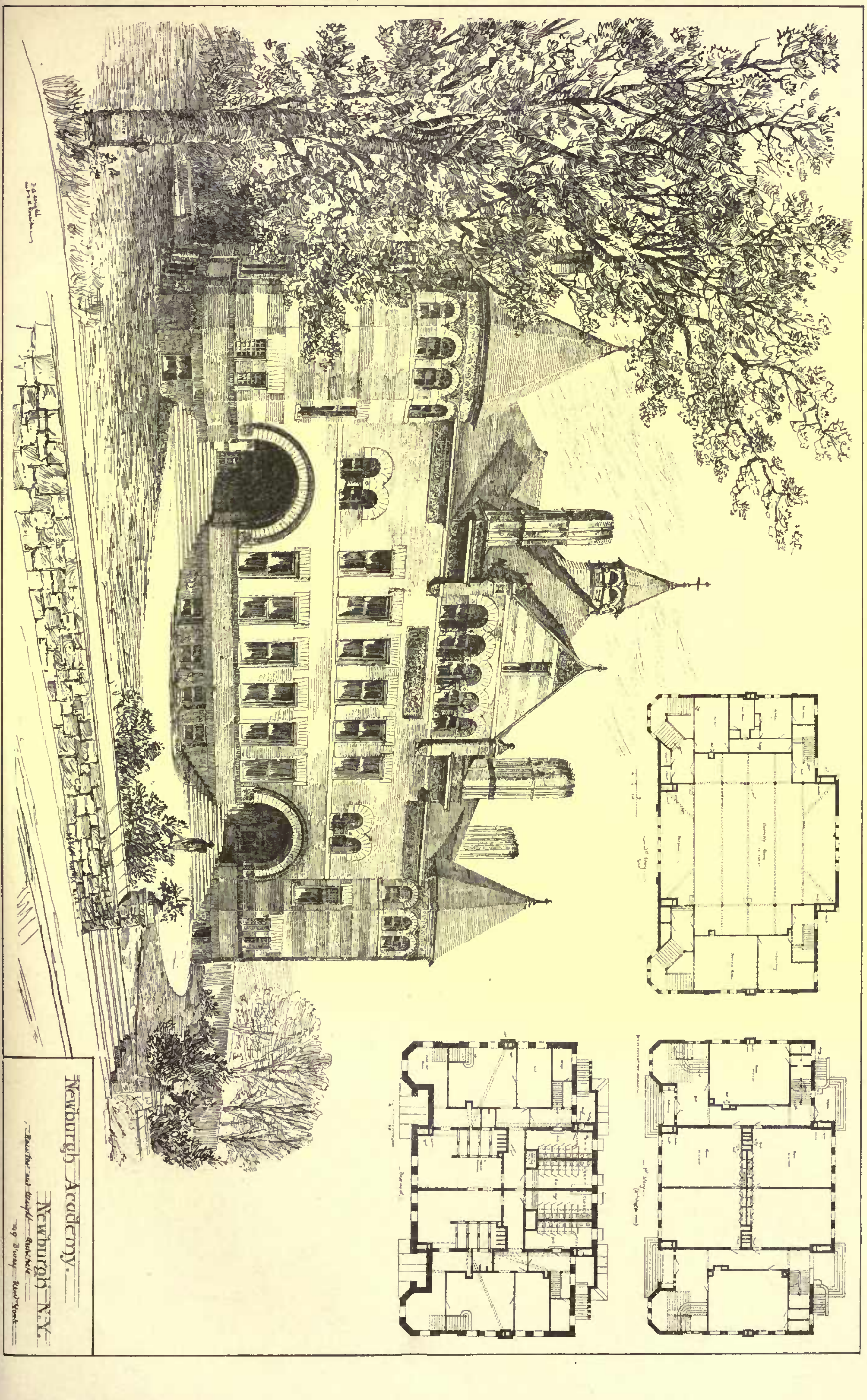
Tower of the
Palazzo Guinigi.
Lucca

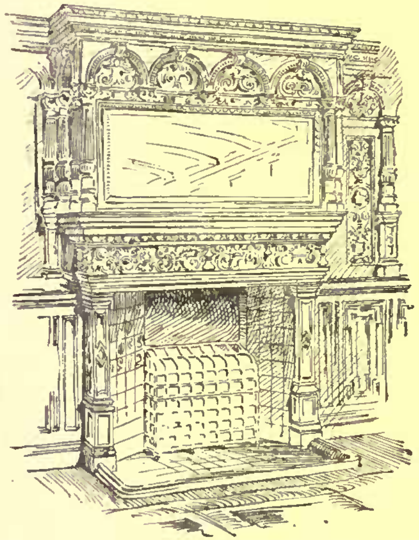


The Clock Tower
Lucca.

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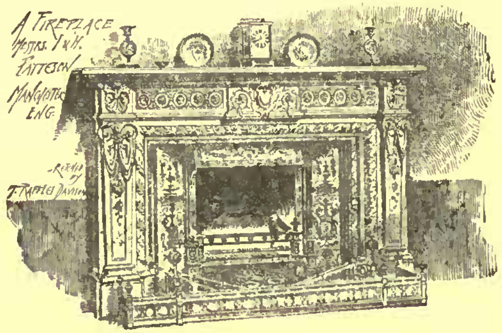




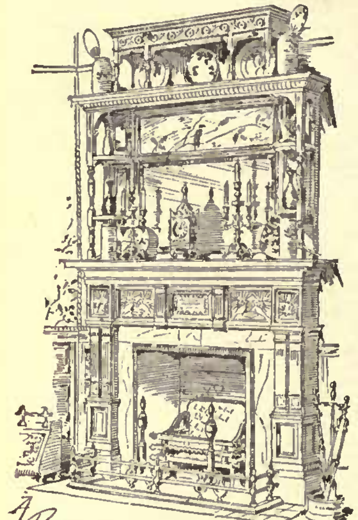
"Mantel" in Cabin of Sir A. B. Walker's Yacht: George & Peto Archts Lond. Engd.



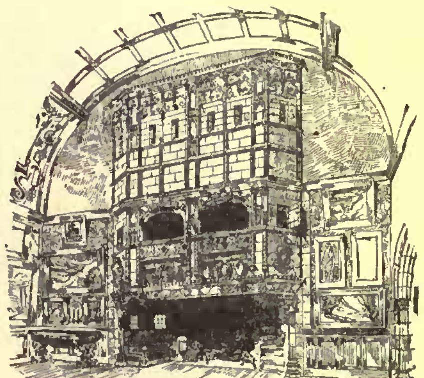
Chimney piece in the Palais de Justice, Bruges Belgium.



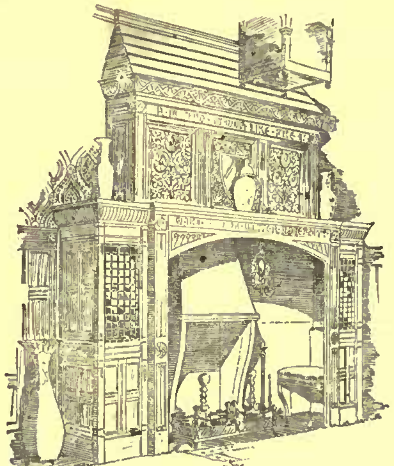
A Fireplace Messrs. Y. W. Patteson Manchester Eng.



A Parlor Mantel — J. R. Gandy in Rosewood

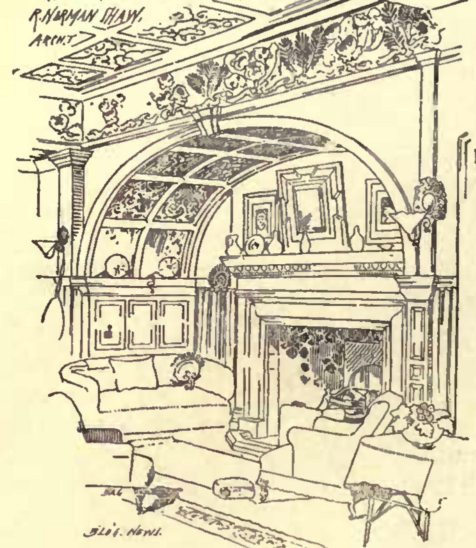


Dawpool, Cheshire Eng. Design for Chimney Piece in Picture Gallery.



Hall Mantel — in Oak — Designed by J. R. Gandy.

DRAWINGROOM MANTEL HOUSE AT FROGNAL ENG. R. NORMAN SHAW, ARCHT.



FIREPLACES.

is sometimes strong enough to make us hardly regret that the whole was not achieved. No more valuable text-book for the study of a young draughtsman could be found than these many studies, which might better find a place in some public museum than many things of far more immediately apparent claim to such distinction.

M. G. VAN RENSSELAER.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE NEW YORK COTTON-EXCHANGE. MR. GEORGE B. POST, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial and Gelatine Editions.]

THIS building, which has been occupied about a year, is built of buff brick, and Ohio-stone.

NEWBURGH ACADEMY, NEWBURGH, N. Y. MESSRS. ROSSITER & WRIGHT, ARCHITECTS, NEW YORK, N. Y.

THE building is now nearing completion, at a cost of about $60,000; Thomas Dobbin did the mason-work; Thomas Shaw's Sons, the carpenter-work, and the heating and ventilating work by Isaac D. Smead & Co., of Toledo, Ohio. The building is warmed by eight furnaces burning soft coal. The smoke-flues are alongside large vent-flues, which connect with a space under the floors formed by 2″ x 3″ strips on top of the beams. Outlets for foul air occur at intervals in the base-board. The hot-air inlets are from brick-flues of large area, as shown. The foul air of the first story is collected in a large chamber shown on basement plan, and carried thence under the dry-earth closets to the foot of the vent-shafts. The floor under the closets is concreted, and has eight inches dry earth laid over it, on which the excreta and urine fall. The strong current of warm foul air carries off all moisture, and the dry residue of excreta is pushed up the brick passage to the mouth of the vent-shaft, and there burned. Or it may be burned without moving; the floor and closet-seats being entirely of iron. The heating and ventilating including the closets cost about $5,000. Smead & Co. guarantee results as above under heavy forfeiture. The building is one hundred and fourteen feet long, and about sixty-seven feet deep. Contains twelve class-rooms, and a large assembly-room in the third story. The materials are brick, Belleville brown-stone and terra-cotta. Three kinds of brick are used in contrast on the towers, and below the first-story sill Croton brick and New Windsor brick are alternated in bands of from ten to fifteen courses. The window and door openings are twice moulded: the jambs in brick, and the flat arches in stone with the mouldings running around. The brown-stone is richly carved, with Byzantine foliage on the large torus of the entrance arches, the voussoir caps, the capitals and twisted columns in the front gable. The cornices and frieze are in terra-cotta, furnished by the Boston Terra-Cotta Co., after details by the architects. The ornamentation is rich, and in keeping with that of the stone-work. The date panel, finials, hip-rolls, crestings, etc., are in terra-cotta. The roof is covered with black slate, except the towers which are in red slate. The interior is finished in yellow-pine, plainly for the most part. The assembly-room has a handsome open-timber roof. The main stairway is in quartered oak, with carved newels. The building stands in the highest part of the town, and masses well from the river. From the street, however, the view is unfortunate on account of the situation on a high terrace, and too near the street line. The citizens of Newburgh were inclined to censure the Board of Education for such a large expenditure of money, but now that the building is nearly done they generally take great pride in it.

This drawing was hung at the recent exhibition of architectural drawings in Boston.

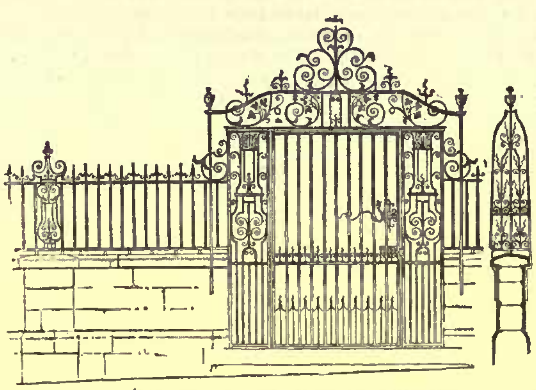
DESIGN FOR THE CLUB-HOUSE OF THE NEW YORK ATHLETIC CLUB. MR. H. EDWARDS-FICKEN, ARCHITECT, NEW YORK, N. Y.

THIS design derives an interest from the fact that the architect was obliged to sue the club for his commission, as detailed in our issue for February 6, 1886.

A GROUP OF ITALIAN CAMPANILI. SKETCHED BY MR. R. CLIPSTON STURGIS, BOSTON, MASS.

A DONATELLO CELEBRATION. — The Florentines are about to celebrate the fifth centenary of the birth of their famous townsman, Betto di Bardo, better known as Donatello. The month and day of his birth are uncertain; but an authentic statement made by himself fixes with sufficient precision 1386 as the year when he was born.

AMERICAN ARCHITECTURE AS SEEN BY ENGLISH ARCHITECTS.



Wrought. Iron. Gate. and Railings. English. date 1725.

WE shall look forward with interest to the publication, in full, in the *Transactions* of the Royal Institute of Bristol architects of Mr. J. B. Gass's paper on "Some American Methods," which seems to have awakened amongst the listeners, more interest, perhaps, than is usually roused by the reading of a returned traveller's notes.

The abstract published in the *Proceedings* and in the professional journals rehearses for us, in its abbreviated form, a "twice-told tale"; but the remarks of those who spoke after Mr. Gass had finished his paper are of real interest, as they seem to indicate that American architects are in a fair way to achieve a reputation as scientific constructors — if not artists — parallel with that which the world already accords to American engineers. We therefore give them below:

A. J. GALE, *Associate* (Holder of the Godwin Bursary for 1882). — I should wish to compliment Mr. Gass upon his paper, and my object in rising is to propose a vote of thanks to him for it. In doing so I should wish to particularly express my gratification and interest in seeing the drawings upon the wall. It is not an easy matter, I know, to go to America and investigate the architecture there, because there is so much to see, and an immense amount of inquiry has to be gone through. Mr. Gass is quite right in speaking of the help which American architects give to any one who goes there. Without their help the collection of drawings which we have before us would be simply impossible. They, of course, are gratified that their work should be studied by English architects, and certainly the study of it is beneficial. I trust that this will not be the last occasion on which the holder of the Godwin Bursary will go to America. . . .

It strikes me, in looking at the drawings this evening, though I did not go to Canada, that, speaking from an artistic point of view, Canadian work is not equal to the best work in the United States. Perhaps Mr. Gass will be able to say whether this is so. With regard to American work, I think there can be no doubt that Mr. Richardson's work is exceedingly good, and I gather that he is doing one of the most useful things that can be done for American architecture, in that he is training for the profession in his office men who will worthily succeed him. With regard to the systems of ventilation, I think there can be little doubt that American work, in that way, is far ahead of ours. I do not know whether clients here experience difficulty or hesitation in paying for what are, no doubt, very elaborate systems of ventilation, but we very seldom see, here in England, anything approaching the number and efficiency of the ventilating arrangements which Mr. Gass has described to us. I suppose it is because the climatic difficulties in America are so great; in winter the cold is intense, and in summer the heat is the same, and if they did not have artificial ventilation of a complicated kind, I suppose life, in their public buildings particularly, would be intolerable.

JOHN SLATER, *Fellow.* — There can be no two opinions as to the value of the paper we have heard, and I am sure we have inspected these drawings that are around the walls with admiration, perhaps in some few cases not unmingled with awe. . . . It appears to me that, with regard to the structural methods of America, there is a boldness, a thoroughness, a directness of aim and a lack of conventionality which are extremely refreshing. Whether the same lack of conventionality on the art-side is a success, is open to question, but as to the structural part there can be no doubt of the success attained. Mr. Gass has referred to the fire-proof systems in use in America, and without doubt they are far ahead of us in that respect. I think it is possible that expense may affect matters more here than there, but still it is possible to make our buildings more fire-proof than they are, and without incurring any very great expense. I should like to draw attention to the fire-proof system that has been invented by Mr. Lindsay, of the Paddington Iron Works, called "steel decking." It consists of something like troughs, which are made of moulded steel, and are in the shape of truncated equilateral triangles; these are filled-in completely with pumice-concrete, so called, I suppose, because there is no pumice-stone in it. It is extremely light, and the depth is not much more than half what would be required if rolled iron-joists were used. It is being used largely by Mr. Waterhouse at the National Liberal Club, and I think by Mr. Blomfield also, and it is well worthy of inspection. From what I have read, I should say that the Americans proceed in a very scientific way with reference to foundations. I believe that in very many cases much greater difficulties are met with in various cities in the States than we meet with here. I read not long ago that in Chicago many of the best sites could not be built upon for a considerable time, because they could find no suitable foundation. I think I have heard you say, sir, that you have been there, and I believe it is a fact that a few feet below the surface there is a stratum of hard-pan three to six feet thick, and then fifty feet or more of treacherous soil, which might be called mud. This is evidently a very difficult matter to deal

with. The American architects seem to have approached the solution of the problem in a thoroughly scientific way. They decided to build upon the hard pan, and came to the conclusion that the only way to build safely was to make an exact calculation of the weights of the building which came upon the supporting surfaces, and then exactly proportion the area of these surfaces to the weights they have to carry. Consequently the pressure upon the hard layer is all equal, and no one part has any greater pressure than another, and though it is probable that this stratum slightly sinks down when the building is erected, yet it sinks regularly, and there is no cracking of the building. That seems to be the proper way to approach a problem of that kind. Again, I think we cannot read the professional journals of America, we cannot look at the programme of the various industrial universities and institutes of technology, without seeing the immense strides the Americans have made in the subject of architectural education. They are a young nation, and we are an old one, and yet they have done infinitely more. I admit that, during the last few years, we have done a good deal, especially in connection with the obligatory examinations; but we have not gone far enough, and I believe that this question of education for students is one that must be faced, and thought out, by the Institute, combined with other bodies. I copied out of an American paper the course of study of the Massachusetts Institute of Technology, and I refer to it now because it seems to me that the student in that country has before him an opportunity of acquiring information which is wanting here. I believe the ordinary course for architecture there is four years, but they fully appreciate that every one cannot give up that amount of time, and so they have instituted a course of two years for those who are unable to give the full time. This is going beyond the scope of the paper, but I think we ought to follow the subject up. I am quite sure that no greater good can be done, than by learning something of the methods of other countries, and occasionally taking stock, as it were, of our own deficiencies, and seeing how we are progressing in the right way; and, with this in view, may I offer a hint before I sit down? We have in connection with the Royal Institute of British architects, a number of Honorary and Corresponding Members, and could not some means be adopted for making them a little less honorary and a little more corresponding? Great good would be done if they would occasionally give us a communication as to what is going on in their respective countries, and if that were brought before this Institute, I think it would be greatly to our benefit. We should, in this way, get a little knowledge of what goes on abroad, in addition to what we get from the holder of the Godwin Bursary, and from the professional newspapers. I shall be most happy to second the vote of thanks to the author of the paper.

Alexander Payne, *Fellow*, expressed a hope that the splendid set of illustrations exhibited by Mr. Gass would remain on the walls for some time, as they appeared to be the best exhibition of American works he had seen.

The Secretary stated that they would remain on view during the week.

Thomas M. Rickman, F.S.A., *Associate*. — I think Mr. Gass has done wisely, where there are so many, only to give us some two or three portions of what he has gathered, and to confine himself to those few points. Seeing the buildings in Canada and the United States, one sees in all their phases a very great change from the architecture of this country. One sees the survivalism which we have here, which has been transplanted, and also buildings in every style corresponding with our own; but one also sees, when one gets to the United States, a class of buildings altogether different. There, architects have thrown aside survivalism, and have worked according to their own ideas. Now, one thing I noticed, when there was — that though there were buildings most objectionable according to any canon of taste — one was not so much struck with the *bizarrerie* of their appearance as was to be expected. There, building seems to be of styles which in this country we have grown out of, and the Americans are also growing out of them; their newer buildings have more reason in them. Such architecture is now gaining ground, and there is so much purpose and intelligibility in the work that I was greatly pleased.

R. Phené Spiers, F.S.A., *Fellow*. — I think it may be interesting to add one or two words respecting the origin of a great deal of the best architecture that we see here. The American architects have studied chiefly in France. Mr. Hunt is one of the former students at the Ecole des Beaux-Arts, and Mr. Richardson was a fellow-student of mine when I was there. It may be remembered also that in 1867–68 Professor Ware came over here in order to make a study of English architectural education, and he subsequently went to Paris, in order to study for six months a scheme of architectural education for the Institute of Technology at Boston, to which Mr. Gass and Mr. Slater have referred. Mr. Ware collected a large number of casts and drawings, and in Paris he entered the studio of one of the rising architects there, in order to master more completely the whole system of the school. It is that system which he has introduced into the Institute of Technology at Massachusetts, and it is that system which he is carrying out now at the School of Mines of New York. From time to time I have received the visits of a great number of his most promising pupils. He felt that the education he was giving them was not sufficient, and so he has invariably advised them to go for one, or two, or more years to Paris. On their way he invariably sends them to me to advise them, and I have been able to follow their careers. The style, therefore, which the Americans, or those students who have been pupils in Professor Ware's school, have taken as a starting point is the *Néo Grec* style. This style in Paris is shown in its finest qualities in the Ste. Geneviève Library opposite the Panthéon, by Labrouste, in the building of the Ecole des Beaux-Arts, by Duban, in the National Library of Vaudoyer, in the Timbre or Stamp Office of Baltard, and various other buildings which I might mention. The *Néo-Grec* style may be considered as typical work of the second and third quarters of the nineteenth century. If you bear that in mind, and look at the photographs and the drawings of Mr. Richardson, you will see from whence he draws his inspiration. At the same time you will see how the practical requirements of the Americans are met in the Byzantine or *Néo-Grec* style, and how it has come to be so materially altered as to constitute, to a certain extent in his designs, a series of original conceptions. I would call special attention to the photographs of the Harvard Law School. They contain a large amount of originality and peculiar refinement, mixed with extreme breadth and boldness of treatment. It would have been impossible for an English architect to have dared to go to that extent; he would have had against him the criticisms of all those who are afraid of sinning against the laws of recognized archæology. I remember, I could not help thinking that when Professor Ware went home he would be, in one sense, a happy man, because he would be able to found a style upon principles, his pupils would not always be bound by precedent, and he would be able to bring materials into use which we find it difficult to do in England. That has been borne out, I think, in the work of his pupils.

Henry Dawson, *Fellow*. — I should like to say one word with reference to the remark of Mr. Slater, when he intimated to us that Americans at Chicago had shown great originality in exactly calculating the weights that were to be placed upon the bearing-surfaces, and proportioning the area of these to the weights. That is a very old affair in this country, and by no means confined to the scientific discoveries of America. In that respect we are a great many years before them, and they have simply followed in our wake.

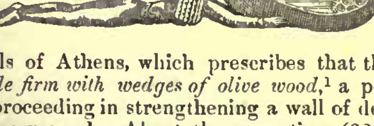
Professor Kerr, *Fellow*. — I was in America some forty years ago, and since then have always taken a great interest in American architecture, and I have been accustomed to say, amongst other things good and bad, that no one in this country knows what freedom of thought is unless he has seen it exercised on American soil. In architecture there are two things in which America may be expected to make considerable progress — one is ingenuity of construction and the other is originality of artistic design. With regard to ingenious construction, the Americans, in their own language, beat all Creation. The whole population of America seems to grasp the necessity for new inventions, and when an invention is brought to bear fully upon any requirement, it seems to be done, not in the rough-and-ready way as we are too much accustomed to think it is, but in a precise and practical way, which, to my judgment, shows the Anglo-Saxon intellect at its best. I therefore think we may trust ourselves to receive with considerable interest the explanations, which the lecturer has given us to-night, of the various contrivances with which he came in contact. It is not necessary for me to go particularly into them — they have already been discussed; but I have no doubt in my own mind that in the course of the next generation American inventors, in respect of building, will do a great deal, for there is a great deal to be done. We seem in this country to be too much trammelled with old traditions; we do not seem to get beyond the instruction that we received at school. The Americans throw all that to the winds and strike out for themselves, when the occasion occurs, with some new contrivance. Upon the question of design, I am glad Mr. Spiers has said what he has with regard to the influence of the French. The Americans occupy a very peculiar position. You must always bear in mind that the Americans are the English of the future; and I think Mr. Gladstone's theory is perfectly right: that the Americans are so far ahead of us, that if we look at what they are doing now, that is probably what we are about to do in the course of a certain time — in respect of architectural design, which is a much more difficult thing to deal with than mechanical contrivances, because it seems to march with the ages in a career of its own, independent of all individual effort or control. When I was in New York, forty years ago, the large brown-stone church at the south end of the Broadway (Trinity Church) was just finished. It was considered a very fine church, which, indeed, it was; but there was another church at the other end of the Broadway, called Grace Church. That had a spire with crockets, all of cast-iron, and painted like gray granite. The editor of the *New York Herald*, the present Mr. Gordon Bennett's father, criticised this spire. He compared it to a crocodile standing on its head. There is too much of that style of criticism still in vogue, and nearer home. However, since then, the Americans have made amazing progress, and, as Mr. Spiers has said, it is due very largely to French influence. They come over, they get my friend's advice, and mark all that we are doing, and, depend upon it, they digest everything they find here, as elsewhere. Well, then, there will be a sort of cosmopolitan style of architecture gradually evolved in America. Wealth is developing in many ways more rapidly there than here, and I think during the next generation our successors will find architecture appearing not as sham Gothic or even, perhaps, as *Néo-Grec*.

The President. — It is a great satisfaction to me to hear such a paper as this read. It shows what a far-reaching idea Mr. George Godwin's was, for the collection of information respecting the practices of architecture in different countries. Nobody can pass through any city in America without learning at every step. He will see much that will disgust him, no doubt, because people who go ahead in the way the Americans do, do a great many things that we should be ashamed of here in matters of art. But the impression that I derived from what I saw in America was that there was a great revolution going on, that a great deal of bad work had been done, but there was a foundation of good work laid, and that a grand future was before its architects. With reference to Mr. Richardson's work, I was never more surprised in my life than when I saw the tower of the church that he built at Boston. It is a tower that it is a real pleasure to look upon, on account of its enormous mass. It must be double the bulk of any tower with which I am acquainted that has been erected in modern times in England. I do not know the exact dimensions, but it must be over sixty feet square. It is not a lofty tower, but it is a grand square mass which is very striking indeed. Then the plan of the church itself is very good. There is a wide nave and a choir with a spaciousness of aspect about it that is quite charming. I cannot say that I agree with Mr. Gass as to the details, because I do not think that they are up to the mark; but it is a question of growth. American art is a giant that has grown rather too rapidly, and therefore there is not the amount of finish about it that there ought to be. Mr. Spiers spoke about the French influence on Richardson's work. I was only in Albany for a short time, but in the great building of the Capitol three architects have been employed, and

the superiority of the work that has been done by Richardson is very striking; but it struck me that it was Florentine in its character rather than French; possibly, however, my view was too hasty. I was like the Americans, gning at too great a pace, and so had not the opportunity to study it, but it seems to me that there was power in that work, and that the man who had designed it was going to develop into a great architect. It is a great pleasure to me to hear that he has a school of pupils, because one of the great defects of the American system is the short time they allow for acquiring a knnwledge of their profession. The Americans cannot bear to go slowly. They will not give the time for studying which they ought to do. But if they get a few men with such original ideas as Richardson, then we may expect a great school of architects. Professor Kerr truly said, there is great wealth in America — wealth increasing at an enormous rate. Nobody can help being struck by the extraordinary material advantages of that country. Wherever you go there is an abundance of everything; the production of the country is prodigious, and we cannot therefore but hope that architecture may flourish by its products rightly directed. We have heard a good deal to-night about systems of ventilation, but there was great comfort to me in one thing that was said. The Americans think us excessively stupid; but there is some stupidity also on the other side of the Atlantic. Mr. Gass not only amused, but delighted me, by saying that when he went to examine the ventilating-shafts he found them all closed up. That is almost invariably the case in English houses, and it is a great comfort to me to think there is equal stupidity amongst these go-ahead people in America. As to foundations, I think Mr. Slater has very properly called attention to that matter. But the same kind of thing is done in this country, and it is no new experience, though I do not think we go so closely into the calculations as Mr. Slater tells us the Americans do. It will be a great satisfaction if the Americans take a few hints from Mr. Spiers upon the subject of education, because they will be very much benefited by his advice. One difficulty they have to contend with, and which was admitted to me by every gentleman to whom I mentioned the subject on my passage home, is the universal tendency to jobbery. That is the most damaging thing they have to contend with in connection with their public buildings. At Chicago I saw a great building in progress, and I do not know how many architects had been employed upon it. When the Government changes the architect changes, and the consequence is that you get all kinds of styles mixed up, and a building, which ought to be a fine one, is utterly discreditable. There is only this comfort, that in a place like Chicago, where they think more of business than of beauty, they cover up the whole façade with such a network of telegraph and telephone wires that you cannot see it. This tendency to jobbery is a very serious matter for architecture; we are not entirely free from it in this country, but we are freer from it than they are. I hope our institutions will not be so changed as to let in such a flood of jobbery as that which is admitted to prevail in America. The Americans have a sneaking fondness for the old country, and in that Boston church I have mentioned, I was uncommonly pleased to see an old stone window which had been brought from the original Boston. They had carefully set it up in a porch, which is of so totally different a character.

The vote of thanks, having been put to the meeting, was passed by acclamation.

GREEK AND VENETIAN MASONRIES.



WE find upon a slab of Pentelic marble an inscription of the fourth century, B. C., containing the specifications for the work of repairing the walls of Athens, which prescribes that the stones inserted shall be *made firm with wedges of olive wood,*[1] a perfectly justifiable method of proceeding in strengthening a wall of defence already existing and above ground. About the same time (329 B. C.), they repaired the walls of Eleusis.[2] Here, too, they used wedges of wood tarred, a necessary precaution, as the kind of wood employed at Eleusis was sensible to dampness; in this inscription only elder, elm, ash and cypress are mentioned.

Another interesting application of olive wood, and more particularly of *wild* olive, is recorded in an inscription of the second century B. C., which is the project for the construction of the new path near the temple of Livadia. After determining the method of working the slabs of stone, and the preparation of the bed for them to rest on, it is said that for the purpose of levelling *cubes of wild olive are to be kept ready,*[3] a procedure which finds a singular parallel in the Mediæval Venetian constructions, where the stones are made firm by lead. The bases of the arches of the Ducal Palace, which needed to be carefully levelled, were placed upon a piece of laminated lead previously laid in the centre of the capital and fastened all around with wedges of wood in order that when they poured melted lead into the joint the bases might be considered firm; the wedges remained shut up in the lead, and when the capitals were taken out in the work of restoration several were found; they are of larch, about as large as a finger, singed by the lead and much compressed by the weight of the edifice, which we may say they had sustained alone.

It is possible that the Venetians imitated the Byzantines in the use of lead in masonry, which Procopius glorifies in describing the method of placing the building materials in the basilica of S. Sophia: "They do not join them with quick-lime, or with bitumen which Semiramis's ambition lavished at Babylon, or with anything of that kind, but with lead, which was poured into the joints and ran into all the interstices, fastening the stones together.[4] But the Byzantines in this only followed a practice handed down from their predecessors, since the Greeks, before the Roman rule, used melted lead as a joining substance when they could not obtain the contact by rubbing together the stones. And the inscription of Livadia relates that the leading was done in the presence of the master of the works. Now the cubes of wild olive to be held in readiness are those, as it seems to me, that, having been marked and put in their due places sustained the slabs of stone which, although unequal underneath, nevertheless when laid upon the cubes offered an exact level upon the surface of the pavement for which nothing was left to be done but to polish the joints and pour in the melted lead. M. Choisy[5] thinks, on the other hand, that the cubes served to sustain the instrument with which they verified the levelling of the slabs; but was olive wood necessary for this, and wild olive at that, and well dried? The specifications for the cubes or dice or cushions of wood are plain: they were smoothed, each one had to be marked, they were of *wild* olive, because the ancients knew that the non-domestic trees gave a stronger and denser wood,[6] and they were dry, or dried, so as not to produce any steam during the leading.

Thus the ancient Greeks did just what the Venetians of a good period (XIV Cent.), did. It is worth while to compare all this attention paid to the proper use of heterogeneous materials, with the inexperience in the primitive Venetian constructions (IX Cent.), when they made the trachites on the basement of the Campanile and S. Marco firm by means of fragile bricks and fragments of sandstone.

GIACOMO BONI.

[1] ΚΑΙΣΦΗΝΩΣΕΙΣΦΗΣΙΝΕΛΑΙΝΟΙ[ς]. *Corpus Inscriptionum Atticarum,* II. 1. 167.

[2] C. J. A. II. II. 834, *b.*

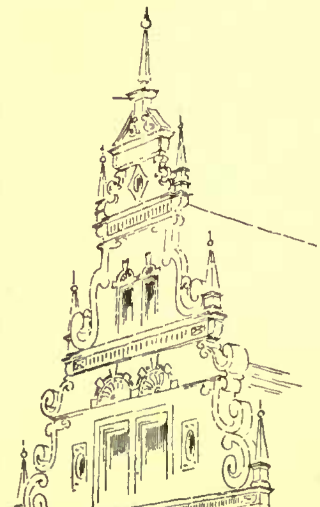
[3] ΚΥΒΟΥΣΚΑΤΑΣΚΕΥΑΣΑΜΕΝΟΣΞΥΛΩΝΞΗΡΩΝΑΓΡΙΕΛΑΙΝΩΝ. Αθήναιον. IV. 454. *Fabricius, Comment. Grigr. Berl.* 1881.

[4] *Etudes épigr.*, p. 205.

[5] De ædif., I. 1.

[6] *ἰσχυρότερα γὰρ ναὶ πυκνότερα.* Thephor. *Hist. plant.* IV. 13, 1. And elsewhere (V. 7, 8) he says that the ma lets and pins of wild olive were the best.

CRITICISM AS UNDERSTOOD BY THE *CRITIC.*



"SOME surprise has been expressed at the appearance "in two recent numbers of "*The American Architect* of a long "article entitled 'Sitting Statues.' "The title is a misleading one, for "the paper is devoted to the consideration of a single statue — Mr. Olin "Warner's 'Governor Buckingham,' "unveiled two years ago in the Capitol at Hartford, Conn. It is not "this fact that has surprised the "readers of the *Architect*, however, "but the more serious one, that the "whole article is an overt attack on "Mr. Warner, and a covert attack "on Mr. Augustus St. Gaudens — the "best two of our younger sculptors. "The attack on Mr. Warner consists "in dwelling at length on his advantages as a student and the great "expectations which his earlier work "had led his friends to form of his "career, and then pronouncing the "result of his most important artistic "effort a death-blow to all these "hopes. Mr. J. Q. A. Ward comes "in for a little abuse over Mr. Warner's shoulders; while Mr. John "Rogers, whose statuettes are familiar in many households, is singled "out from the body of American "sculptors for especial praise. The "attack on Mr. St. Gaudens is very "subtle. It consists in ignoring him "where the mention of his name is "imperatively demanded. There is "singular indelicacy in an artist's "thus attacking his more fortunate "rivals, and it is unaccountable that "a journal of the *Architect's* standing "should open its columns to such an "assault." — *The Critic, April* 3.

WE fear that personal friendship for the two sculptors it champions obscured the usual good judgment and perceptive faculties of our good friend the *Critic*, or it would not in so few lines have offered so many opportunities for refutation and rejoinder.

We do not propose to interfere between Mr. Bartlett and his critics any further than to suggest that the impartial public will find Mr. Bartlett's method of writing, over his own name, more manly than that followed by critics who characterize as an "attack" a criticism of Mr. Warner's work which sums up the writer's opinion in these words: "With the exception of the Buckingham, we believe that his work is the best and most legitimate contribution yet made to our sculpture;" who forget themselves so far as to say that John Rogers is "singled out from the body of American sculptors for especial praise;" whereas he was, in truth, very casually mentioned

as possessing a "certain illustrative tendency" — faint praise, of which, we trust, no one will be so unkind as to deprive him; and who accuse Mr. Bartlett of "indelicacy" in presuming to criticise his "more fortunate rivals," and yet seem to be blind to the fact that, through their choice of phrase, they may seem to lack that perfect delicacy which would refrain from flouting a man for his lack of success. In one point we heartily agree with the critics, that is, that the "attack on Mr. St. Gaudens is very subtle." This attack, it seems, consists in omitting his name at a juncture where its mention is "imperatively demanded." The only place which seems to fit this description is in the sentence above, which we quote from Mr. Bartlett, to which the critics would like to add, perhaps, the qualifying phrase, "except, of course, the works of Mr. St. Gaudens," and, by so doing, would deprive Mr. Warner of that pre-eminence which his critic most willingly accords him.

For our part we distinctly are not parties to the controversy, and are not to be understood as endorsing Mr. Bartlett's opinion; we only speak to the fairness and propriety of the *Critic's* language, urged to it by the "surprise" our action occasions and the statement that it is "unaccountable."

We do not know any architect whose every work is beyond praise, and we do not believe there is any sculptor whose work is always and wholly good, and we do not know of any canon of art criticism which debars an artist, successful or unsuccessful, from being a most judicial and truthful critic. It is a fact, we believe, that our art critics through their command of adjectives in every degree of comparison have brought it about that few artists have any true idea of their real merits, and we can conceive it to be intensely disagreeable to an artist and that artist's friends to have said aloud anything that is not couched in the usual terms of fulsome adulation. For our own part we find extremely distasteful the modern method of critically examining, analyzing and dissecting the work of a living man — unless he be a foreigner and so not likely to see what is said of him — and, moreover, false, because the work is often done with a bias, and almost always a favorable one, so that, consciously or unconsciously the critic presents the favorable side only of his subject, and gives to the world as a complete study what is really only a partial one — in more senses than one of the word. It was because we found Mr. Bartlett as willing to blame as to praise, and willing to do both unflinchingly, that it seemed to us worth while to publish the series of articles the title of which the *Critic* tells us is "misleading," a statement to which we beg leave to take exception.

AN INSTANCE OF ATTEMPTED BRIBERY.

IN some ways, it is rather a pity that Messrs. Pierce, Butler & Pierce, of Syracuse, N.Y., manufacturers of steam-heating apparatus, should find it necessary to come to the public prints for a hint that, as a rule, it is not provocative of the most lasting benefit to name or pocket to approach a general officer of the United States Army, on the retired list at that, with an offer of a bribe. Messrs. Pierce, Butler & Pierce will do well to give their clerk who wrote the letter an army-list to study, and they would do equally well to consult some friendly architect, and get from him a *partial* list of those architects by whom such a document as the one below would not be considered as a "confidential matter."

Syracuse, N.Y., March 8th, 1886.

Mr. M. C. Meigs: —

Dear Sir, — We send you catalogue of steam-heating apparatus describing our celebrated "Florida" boiler. An examination of details cannot fail to convince you of its superiority in all respects, and best of all, its comparatively low price. If you will send us pencil tracings or blue-prints of floor plans of any residences or buildings you may have on your tables, we shall be pleased to forward to you, at our expense, estimates of the cost of heating, with full details, *and will allow you an architect's commission of five per cent* on all Florida boilers which you may use and specify. We guarantee our boilers to fully perform all that we claim, so that in using them you take no risk of failure. If you have any large work open to competition, or on which you desire figures, please inform us, so that we may estimate, and we pledge you *satisfactory* arrangements.

We trust that you will regard this matter as confidential, and should you favor us, we will see that it is satisfactory and profitable for you to do so.

Very truly yours,

Pierce, Butler & Pierce.

COMMUNICATIONS

THE COST OF PROTECTING BUILDINGS AGAINST FIRE.

Boston, April 3, 1886.

To the Editors of the American Architect: —

Dear Sirs,— In your excellent article upon the lesson which may be learned from the long experience of the Factory Mutual Companies, I think you have there only one part in which I do not fully concur, and that is in assuming that the cost of protecting or altering buildings, even as they are now constructed, would be ten per cent of the value of the buildings and contents. This is a very excessive estimate.

In the case of the factory costing, for instance, five hundred thousand dollars, filled and stocked ready to start, the proportionate expenditure would be one hundred and fifty thousand dollars for the contents, consisting of machinery and stock. This expenditure would include all the inside fire-apparatus, including pumps, pipes and sprinklers, as well as the outside hydrants, pipes and other apparatus of the same kind.

The cost of the entire fire-apparatus, including automatic-sprinklers at the rate of one sprinkler to every hundred square feet of floor-surface throughout the premises, would not exceed eight thousand dollars, but in order to cover remote contingencies we may call it ten thousand dollars; and then, as you will observe, you have only two per cent upon the whole cost for the fire-apparatus, assuming that the water-supply is to be drawn from a public service: where special reservoirs are required to be built by the factory corporation there would be an additional cost; but such reservoirs serve many other purposes besides prevention of fire, and therefore ought not to be included. If the building under consideration be one which requires the strength of the cotton factory, the cost of safe construction is no greater, if as great, as the cost of the ordinary warehouse examples of combustible architecture. Even the requirement of plastering on wire is only made in the specially hazardous departments, constituting a very small part of the ordinary mill risks.

Smaller buildings devoted to purposes which require less strength in construction, could only be made suitable for insurance by some addition to the original expenditure, to make them more solid so as to burn more slowly.

The ordinary fire-traps which serve for a few years for shoe-factories, paint-shops, and the like, may be defended in some measure upon the ground that the owners can afford to burn them somewhat often at the cost of the underwriters, rather than to expend more capital upon them.

There are many ways of making existing buildings which are now of bad construction, not only safer, but better; for instance, if a building is surmounted by the ordinary hollow roof consisting of thin boards, slated on the outside, sheathed inside, enclosing a delusive air-space which is supposed to be a preventive of heat, safety requires the removal of the sheathing and the use of the same material fastened up lengthwise between the rafters close to the under side of the roof boards.

When this has been done, the underwriters have ceased to take objection to the rafter construction, and the owners have found that their attics were cool in summer and warm in winter, so that they could be made use of where they had previously been almost useless.

Two or three conspicuous examples of the mill walls permeated by air-spaces, which we commonly designate as fire-flues, between the brickwork and the sheathing, have been successfully treated. In one case, the buildings constituting a very large risk in a very cold place, consisted of an outer wall of brick, against which were set studs of about four inches, on which sheathing had been nailed. The erroneous idea of the architect had been that the air-space would prevent dampness passing through, and would tend to keep the building warm. Although the work done in this mill was of a very safe character, and the buildings were low, the insurance upon them was declined unless the owners would either remove the sheathing or fill up the space with incombustible material between it and the brickwork. They concluded to adopt the latter method, although we would not become responsible for success. They made a mortar of coal ashes ten parts, and lime one part, worked it rather thin so that it would run into all the spaces. They removed the top board of the sheathing on the inside, and poured the mortar in, thus making a solid wall. It hardened very soon, and is now like brick. The report after the first winter is that the rooms were very much warmer; no wind could get through and no dampness. The owners now state that they would make the change without regard to safety, merely for the purpose of economy of fuel, in case they had the job to do again.

You may safely reduce your assumed expenditure in the example which you have presented of one hundred million dollars' worth of property to be treated, from a supposed necessity of an expenditure of ten million dollars for apparatus and changes in construction, to less than five million dollars; and if the consideration of fire is kept in mind in building from the foundation up to the roof, as it should be, you may further reduce the proposed additional expenditure for safety on one hundred million dollars' worth of property to three million dollars; then compute the profit as you have done in your first article, and see where you come out.

If it were possible for all the owners and occupants of property in certain squares or blocks of buildings in this and other cities, to combine for the prevention of loss by fire, I could designate places where each five million dollars' worth of property could be so well guarded, even as the buildings are now constructed, as to render a great conflagration impossible and even an important fire very unlikely to happen, at a cost not exceeding the sum of money now paid annually for the policies of insurance, with which such owners and occupants attempt to guard themselves against personal loss in case of a fire, by distributing the burden upon other people. I do not say that such absolute security would be given as could be had in properly constructed buildings, but such is the value of the contents of many blocks in the principal cities as to render it certain that in place of an investment of ten million dollars in the manner in which you

describe, for the protection of a hundred million, one or two million dollars thus invested would without question prove to be extremely profitable, on the terms proposed, both to the owners, occupants, and underwriters.

I may, perhaps, sign myself as an anti-combustion missionary in the matter of this communication. E. A.

THE BOWER-BARFF RUSTLESS-IRON PROCESS.

NEW YORK, March 18th, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Our attention has been called to an article in your "*Trade Supplement*" of the 6th inst., on the Bower-Barff Rustless Iron Process," which is misleading in the impression given, that the work mentioned for the prominent buildings was done by the "Philadelphia Rustless Iron Company." We manufactured most of the work, and treated it all in our own furnace, and we feel that it is unjust that we should be robbed of whatever credit there is attached to the work. We were the pioneers in this country in introducing the process, and have spent a great deal of time and money in experimenting and bringing it into practical use, as the inventors will testify, and have treated work free of charge to that end, notably the Produce Exchange of New York, and we ask that you would kindly publish this in our behalf. We send you herewith a copy of the 'Bower-Barff Co.'s" prospectus, from which the "Philadelphia Company" have copied most of their article and list of buildings, omitting, however, that part referring to us.

Very respectfully,

HECLA ARCHITECTURAL BRONZE AND IRON WORKS.

[IT was our intention that this communication should find a place in our *Trade Supplement* for April 3, as it was accidentally omitted we give it place to prevent the prolongation of an act of injustice, not necessarily, however, intentional. — EDS. AMERICAN ARCHITECT.]

HOW TO COMPUTE CHARGES FOR PROFESSIONAL SERVICE.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs. — Referring to your remarks in issues of 13th inst. and previous dates — before the matter of the proper method of making out an architect's charges dies out of discussion — I should like to have some opinions as to what the proper per diem charge is when you choose to, or have to, make out a bill in that way. Of course there would needs be a variation in this — a man like Mr. A. B. C., who is so wonderfully talented and so full of paying practice having a different value per hour from Mr. X. Y. Z., who is only commencing and has not much ability and has less work.

But what is the minimum and what is the average per day and per hour? Also, in charging for assistants' time, how much profit should be added; should the same salary you happen to be paying be stated with percentage of profit added on? I may have an assistant at $5 per day whose services are fully equal to others, at $10.

If an unpaid pupil's time is employed, is it to be charged, and if so, how?

The matter is undoubtedly full of difficulties any way we can settle it, but I think there ought to be a little more discussion as to the best way of doing so.

For myself, I am conscious that the value of my day's work to my client varies very much. For instance, the first hour I commence to work on the plans for a new client I might have a sudden stroke of genius, or luck, and hit upon a treatment of plan, say, which would for itself, — for the idea, though perhaps only half an hour's work, — be worth all the rest of my services in that particular matter. Supposing my client suddenly changing his mind and found it suited him or his friends to employ another architect (or a carpenter only), asked me for so much work as I had accomplished, and offered to pay me for the amount of time I had spent on it, what should I do? Surely an hour or two of ordinary pay would not be a fair equivalent for that clever conception of plan. Respectfully, L. M. N.

[THESE are very interesting points, and we should be glad to have the opinions of architects generally upon them. Concerning the matter of the value of an architect's services by the day, as L. M. N. says, the reputation and practice of the individual is the most important thing to be considered, but the minimum charge of three guineas a day, or about sixteen dollars, which is fixed by the schedule of the Royal Institute of British Architects may be taken as the sense of the profession in Great Britain in regard to the value of the time of the most modest person whose attainments entitle him to practise as an architect. The rate at which the time of assistants should be charged is determined, not so much by the salaries paid them as by a proportional division of the whole office expenses. To expect an architect to allow a client to employ his men, and pay them what he would have paid them, adding a small douceur to himself, leaving him meanwhile to foot the bills for office-rent, stationery, heating, and so on, would be obviously absurd: and the simplest way is to add together all the items of expense, divide the total as nearly as possible in the ratio which each man contributes toward earning the revenue of the office, and make this the basis of the charge, where it is advisable to render a bill in that way, adding, of course, a reasonable profit to pay the architect for the supervision, and for the responsibility for their work which he assumes. Engineers often regulate their charges in this way, and it will be found, we think, that there are very few men in either an architect's or an engineer's office whose time can be afforded at less than one dollar an hour, considering, as we must, that a considerable portion of the time for which the architect or engineer pays them, and during which he must keep the office bills paid, is necessarily spent in changing from one piece of work to another, in preparing for out-of-town work, in receiving directions or making reports, and in a hundred other small duties not relating so particularly to any one client that he can be charged for the time occupied in them.

In all this it must be understood that we do not by any means advocate a change from the established system of charging for the professional work of architects by percentage. Although it is always advisable to keep a record of the time spent by each draughtsman, as well as by the principal, upon each piece of work, and it may sometimes be necessary to recur to the time-book, either to satisfy a jury or an auditor that the percentage charge is not exorbitant, or to determine the proper amount to be asked for work of different sort from that provided for in the schedule, there can be no doubt that the percentage system provides better than any other for the equitable averaging of those accidents of a fortunate inspiration in the case of one design, or a long course of study over another, which are inevitable in faithful professional work. As L. M. N. suggests, it would be as unreasonable on a client's part to expect an architect to charge him a very small price because he happened to hit on an admirable plan in a short time as it would be for the architect to expect his next client to pay him an enormous price because he found his particular problem of difficult solution. Every one recognizes this, and the custom of employing architects, not by the day or hour, but to make certain definite preliminary sketches, working-drawings, details and specifications, or to carry his design into complete execution, is the fruit of centuries of experience of such work, and is always regarded as forming the basis of the contract between an architect and his client, unless some other arrangement is expressly stipulated and agreed to by both parties. — EDS. AMERICAN ARCHITECT.]

IRON LINTELS.

LIVINGSTONE, M. T., March 17, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Please describe to us the best plan of cast-iron lintel to carry a twelve-inch brick wall weighing thirty-two tons, equally distributed, over a span of sixteen feet between bearings. Lintel is to be used to carry front of building above first story, ends of which have twenty-inch brick wall to rest on. An argument having arisen, have agreed to refer the matter to you. Would it not be better to use coupled I-beams? Yours very respectfully, H. B. FRENCH.

[WE should much prefer to use the wrought-iron I beams in such a case. If it were absolutely necessary to use cast-iron, the best form would be the "box-lintel," ⊔-shaped in section; but it should be tested with something more than the proposed strain, either by hydraulic press, or by hanging on it a platform with weights, before being placed in the building. — EDS. AMERICAN ARCHITECT.]

THE MOVEMENT OF THE WASHINGTON MONUMENT.

SYRACUSE, March 31st, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I notice on page 148 of the issue for March 27th, 1886, a note taken from the *Boston Transcript* in regard to the movement of the Washington monument. May not the movement of the pendulum be due to the rotation of the earth on its axis? M. Foucault has used the pendulum to demonstrate the movement of the earth, and if I am not mistaken, under similar conditions. I can hardly credit the theory that the mass of masonry is so soon affected to such an extent as spoken of in the note.

Respectfully yours, E. M. BUELL, *Architect.*

[Since the note referred to appeared in print, we have read a statement that Col. Casey denys that he ever said what has been attributed to him. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

THE "TELEPHONE-LADY" AND THE FIRE. — An insurance man tells a story of telephone experience in Detroit, which has both a serious and a comical aspect. The Barnum Wire Works at Detroit took fire, and the watchman on duty rang up the telephone-lady, who, as in this case made and provided, asked: "What number do you want?" Watchman — "Give me the Fire-Department, quick." Telephone-Lady — "What number do you want?" Watchman — "Oh! blank the blank number; give me the Fire-Department. We are all afire. Blank, blank, blank, quick!" Then, having notified the fire worshippers of the condition of things, he rang up again, and asked for the house of one of the principals — the Receiver, perhaps — and was informed by the telephone-lady that "the service of the Barnum Wire Works had been discontinued on account of profane language having been used." — *Exchange.*

HYDRAULIC SALT MINING. — In the eastern portion of the State of Michigan, U. S., a stratum of salt underlies the surface at a depth of 1000 to 2000 feet. Its thickness is irregular, the deposit lying in pockets, some of which are known to be over 200 feet in thickness. At Marine City are extensive works, packing at the present time 350 barrels of salt daily, although the capacity of the well is sufficient to furnish brine enough for double that quantity of salt. An artesian well 1748 feet in depth was bored for the purpose of reaching the salt deposit, which was struck at a depth of 1633 feet, after passing through 200 feet of clay, 650 feet of shale and steatite, and the remainder of the distance limestone. This well is lined with an iron-pipe casing 4 1/4 inches inside-diameter, and a 2 1-2 inch pipe, 1710 feet long, is suspended in the interior of the larger pipe. Fresh water from the St. Clair River is forced into the annular-space between the two pipes by a Worthington duplex-pump of 10-inch stroke, with 10-inch steam and 4-inch water-cylinders. The fresh water dissolves the salt, and the brine rushes up the central pipe saturated with salt. When the well was first used this brine contained twenty per cent of the salt necessary for saturation, but the salt in solution increased until it reached full saturation. The central pipe delivers the brine into an elevated tank holding 100,000 gallons, whence it flows into a settling basin, where the brine is warmed by steam-pipes. Thence it is drawn into grainers which are long wood-tanks 125 feet in length, and 11 feet in width

where the brine is heated by steam-pipes in the bottom. As the water, becomes evaporated the salt forms on the surface and then precipitates, and is moved along the bottom by wood-scrapers operated by an engine, and at the end is delivered to belt-conveyers, which distribute it to various bins in the storehouse. Each of the five-grainers have a capacity of seventy barrels of salt per day. The cost of the well was $7,500, and of the remainder of the works, including boilers of 540 horse-power, machinery, buildings and docks, $28,000. The cost of producing each barrel of salt weighing 280 pounds is said to be 55 cents, and is made up of the following items: Barrel, 17 cents; coal, 13 cents; labor, 20 cents; repairs and miscellaneous, 5 cents; and the average net price during the past year 71 cents per barrel. The brine and the salt have been analyzed by Dr. F. E. Engelhardt, chemist for the State of New York, as follows:

Salt.

Moisture	0.5924
Insoluble	0.0140
Sulphate of lime	1.2240
" magnesia	0.1890
" sodium	0.0160
Chloride of calcium	98.0276
	100.0000

Brine at 62 deg. Fahr., Specific Gravity 1.2015.

Sulphate of lime	0.4790
" magnesia	0.0420
" sodium	0.0020
Chloride of calcium	25.5200
Water	73.9570
	100.0000.

— *Engineering.*

Archæological Discoveries at Assuan. — The archæological season has begun in earnest. No sooner do we record one discovery than another turns up. Last week it was Athens, followed by the Egyptian Delta; and now we receive intelligence of an important series of finds at Assuan. The successful explorer this time is General Grenfell, who has had the good fortune to discover an ancient Egyptian necropolis in the Libyan, or western desert, opposite Assuan, on the left bank of the Nile. Among the tombs already opened are several which date apparently from the twelfth dynasty (*circa* B. C. 3000), and are constructed in the style of the great Lycopolitan sepulchres in the mountain above Siut. They consist of two or more halls, or chambers, connected by corridors, the roof being supported by columns, and the walls decorated with colored bas-reliefs in brilliant preservation. Several of these tombs appear to belong to members of a noble, if not a royally-connected family, the heads of which were probably governors of the province. The largest is described as a truly magnificent sepulchre, measuring 140 feet in depth, by 40 feet in breadth, and containing thirty columns, some square, some round. It purports to be the tomb of a certain prince of Upper and Lower Egypt, who lived in the reign of one Neferkara, and who is represented in one of the wall-paintings as a lame man, leaning on a crutch. A fine "shrine" (?) and an altar (more correctly, perhaps, a table for funerary offerings) occupy their original position in the innermost chamber, and are in perfect condition. The sculptures are very curious, and the aspect of the whole tomb is reported as extremely archaic. From the second to the end of the eleventh dynasty there were, however, many kings named Neferkara; and, until the inscriptions are fully deciphered, it is, of course, impossible to say under which ruler this lame functionary flourished. The tomb is attributed by those on the spot to the third dynasty; but it seems, for many reasons, more likely to date from the time of that Neferkara who succeeded Merenra, of the sixth dynasty. The founder of this line, Ati, was a native of the island of Elephantine, opposite Assuan, and the place first rose to importance under his cessors. It was during the reign of Merenra that Una, a famous gensuceral and prime minister, quarried the granite of Assuan for the sepulchre and sarcophagus of his sovereign, and built a fleet of thirteen vessels at Elephantine for the transport of the same. Pending further details, we should, therefore, be inclined to ascribe the large tomb to a nobleman of that period, especially if the neighboring twelfth-dynasty tombs are those of his descendants. In one of these latter there are found a series of Osiride statues, representing the deceased in mummified form done in baked clay or terra-cotta, and placed in recesses along the corridor. This, at all events, is an entire novelty in tomb decoration. The cemetery will probably prove to be of great extent, as there is evidence of its having been in use down to a late period. The large tomb, usurped by later comers, was found piled to the ceiling with mummies, mummy-cases, and funerary furniture of Roman times, including upward of sixty memorial stelæ. General Grenfell is actively pursuing his work of discovery by the help of our English soldiers, who continue to open and clear out tomb after tomb. — *London Times, March* 5.

TRADE SURVEYS

A Summarizing of the results shown in the building trades for the first three months of the year, so far as has been found possible to tabulate them, indicates in a general way, an increase of from fifteen to twenty per cent in investments. In twelve cities architects' reports and opinions are very much alike concerning work in their own hands, and as to the prosecution of building operations which have passed out of their hands. No one but a confirmed pessimist could find in existing trade and industrial conditions any grounds for denying a healthful condition of things in the building trades, in the industries, in mining, railroad, or other great interests. The worst observation that can be indulged in at this time is, that a large amount of business is being done at very little, if any, margin, and that a large amount of business that will be transacted this year will be done at unsatisfactory margins. It is, perhaps, unnecessary to state the reasons for this. They have been hinted at before. The advance in labor and material was unexpected, although when we look back, it is rather surprising that it should be so. It is doubtful whether there will be such a reaction as will be of any benefit, even were it desirable. The enterprise which his been and is being checked, will be relieved in time, to expend its energy.

Encouraging evidences of building and industrial activity are apparent in nearly all the New England towns and villages. If manufacturers complain of too moderate margins, it is to be supposed the public have reasons to congratulate itself upon lower prices. It does not appear that enterprise has been discouraged or production checked by the narrowness of margins in any industry, and, therefore, it is safe to say the country at large is being rather benefited than otherwise. So long as there is so much idle money awaiting investment, so long will margins continue extremely narrow, and combinations of smaller manufacturers be formed for mutually protective purposes. It is encouraging to note that in several towns and cities in New England, employers are investing money in the erection of houses for their employees, and that the importance of this course is being recognized for more reasons than one. The demand for small houses must of necessity continue, and we have it on authority of well-informed architects and investors that house-building for mechanics and workingmen and persons of limited means will continue probably for two or three years to come to occupy a great deal of the time, attention and money of investors and builders. Building activity is increasing in New York City and surrounding cities, as well as throughout the larger cities and towns of that State. During the first three months of this year, 3,365 transfers of property were recorded in New York City, representing a transfer of $69,000,000, or about 75 per cent more than for the same time last year. Mortgages also show an increase. The numbers being 2,350 for the first three months of last year as against 2,794 this year, and the increase in the amount of money loaned was in a ratio of 23 to 32. During the first three months of this year 1,073 buildings were projected as against 681 for the same three months of last year. The estimated cost of the buildings projected during the first quarter of this year is $17 006,438, while the cost of the projected properties for the first quarters of last year was $9,523,700. Crossing over to Philadelphia, we find a similarly encouraging condition of things; the increase in the permits over the first quarter of last year is about 33 per cent, and in amount nearly double. The architects of that city speak very confidently of the probabilities of the season now at their doors, and have more work in hand by far than last year. Leading real-estate operators speak of a general advance in real estate of from 10 to 50 per cent; much of it, no doubt, is held at speculative prices until a bona fide offer is made. Building operations in Pittsburgh have also been greatly stimulated, but much of this activity is due to exceptional causes, such as the supply of natural-gas, the freedom from strikes, comparatively speaking, and the influx of capital to profit by the numerous exceptional advantages beside fuel, such as railway facilities. The cities along the Ohio River valley are also putting on a new suit of enterprise, and a great deal of activity is apparent there. For many years after the boom given to railway construction, the Ohio River cities, with one, or perhaps two exceptions, increased slowly in productive capacity and in population. The railroads drew traffic and trade in other directions.

But since the development of the Southern States industrially, a spirit of enterprise has been creeping into these cities and has been manifesting itself in the erection of numerous manufacturing establishments, some of them of no moderate proportions, and in the building of a large number of houses, shops, stores and factories. Real estate is also advancing in value in these cities and towns, and no doubt will continue to advance as railway traffic between the North and South increases. The iron trade of the valley in the neighborhood of Wheeling anticipates a great benefit from the projected utilization of natural-gas. Bold projectors are risking money in efforts to find this valuable fuel, at points several hundred miles farther West, but as yet without practical success. The manufacturing towns and cities in the interior of Ohio and Indiana, also feel the stimulus of enterprise and fresh capital. A great deal of money that in years past has preferred to riot in railway speculation has reformed and gone West to grow up with the younger energy of the manufacturing interior. Our building and architectural journals furnish abundance evidences of the enterprise that is moving through these and other Western States. It is no doubt due to the gradual decentralization of our industries. Those States are the shops for the farther West where their wagons, carriages, agricultural implements, much of their hardware, and most of their iron and steel is made. Pennsylvania in the rear confines itself mostly to the heavier mill products, such as rails and heavy products of forge and furnace.

It is only when we enter the Northwest that we meet with the genuine energy which is reducing that region from a wilderness to a garden. The architects of Chicago speak in glowing terms of this year's prospects, and in as equally encouraging terms of the future progress of the Northwest. The railway construction of the last two or three years has only shown the possibilities of this region. At least 1,500 miles of road will be built in what may be vaguely termed the Northwest this year. If rose-colored statements are to be accepted, and all the competing milages built that are talked about, the figures will reach 3,000. A great deal of enterprise is developing itself in this vast region, contributory to Chicago as its commercial centre. Some of our younger architects who have gone there are busy with work such as it is, but it is an excellent schooling. The lumberman's exchanges of Chicago show that there is a decrease in the amount of pine lumber and shingles on hand in Chicago, as compared with one year ago. The decrease in lumber is put at 102,000,000 feet: in pine shingles over 41,000,000 feet. The Western demand for lumber has developed sharply in that and other Western markets within a week or two, and the demand in Eastern cities is being liberally supplied.

The possibilities of placing capital in small sums in the West and South is receiving a good deal of attention among money-lenders in the East. There is a demand for money which hitherto has not been properly met. Western money-lenders are devising schemes, if they are schemes, by which this demand for money can be promptly and cheaply supplied. Building and loan associations are doing very well, but if they can prosper, as they are, there is room for money-lending upon an easier basis. It is, therefore, regarded as quite probable that within the next year or two a system of lending assistance in the South and West will be put upon its feet. No doubt there is room for such enterprise, and that investments of that kind can be made profitable. The building trades would be directly benefited. The importance of an abundant supply of a circulating medium in a new country is not always fully appreciated. The rates of interest which have prevailed throughout the West have been destructive rather than promotive of thrift; what is wanted there is more money, easily secured by industrious workers, on good security at a low rate of interest. The Northwest and West will soon take a fresh start, and nothing will assist as much to build up this rich region as the means for immediately securing homes.

The striking spirit has almost disappeared in many places: the rates of wages may be regarded as fixed. Ugly complications are still possible in the Southwest. The Gould managers have unwittingly done much to lay the foundation for future disturbances not only upon the Southwestern roads but upon others. The laborers have many severe battles to fight yet before they will realize the goal of their ambition. Capital is determined, and will not surrender its prerogative.

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THE NEW YORK COTTON - EXCHANGE.

GEORGE B. POST, Architect.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 538.

APRIL 17, 1886.

Entered at the Post-Office at Boston as second-class matter.

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WE have so often been asked by architects if we would allow our draughtsmen to make for them competitive, exhibition or other drawings for private purposes, and have so seldom been able to comply with these requests, that we have come to believe that by increasing the force at our command we may be able to do a service to those members of the profession who are either too busy to make their own drawings, or who find it inexpedient to maintain a high-priced draughtsman whose specialty is the rendering of drawings. We would not embark on such an enterprise with the expectation of making it independently successful or remunerative, and we make the experiment chiefly in the hope that when we cannot find outside work for our extra force we shall be able to avail ourselves of their services in the preparation of illustrations for publication in our own pages, and in this way be able to raise the standard of their excellence still higher, and givê our subscribers generally greater satisfaction, and less cause of complaint to grumblers who cannot understand why we "publish such a thing as that." It is possible that if our experiment succeeds, our drawing-office may require the assistance of more or less additional draughtsmen, and that we may be able to take on, temporarily or permanently, draughtsmen who would otherwise have to go to another part of the country in search of work, and in this way we might be able to help an indefinite number of capable workers, or relieve some architect, short of work, from the necessity of paying high wages for a month or two to some draughtsman he could as ill afford to keep as to let go. We do not propose to undertake anything but the rendering of drawings—in line or color—the construction of perspectives, and perhaps the working out of ornamental detail at small scale. Working-drawings we do not care to undertake.

MR. BELL, the Supervising Architect of the Treasury Department, and Mr. R. H. Thayer, the Law and Contract Clerk of his office, have made an interesting contribution to the literature of the profession in their little pamphlet, just issued from the Government Printing Office, giving a summary of the organization of the Supervising Architect's office, with copies of the more important official reports and recommendations which have been made in relation to it. The discussion now going on inside and outside the profession, on the best method of carrying on the Government architecture, makes the publication of such a book particularly timely, and the opinions of Mr. Bell upon the matter, founded, as they are, on a thorough knowledge of the requirements to be fulfilled, will command attention and respect from every one. Our readers will probably remember that Mr. W. A. Potter, who occupied the office of Supervising Architect ten years ago, called attention to the difficulty of securing artistic variety and individuality in Government buildings designed by one man, who must at the same time attend to the details of administration of a very important public office, and, without suggesting any definite scheme for improving the design of the Government buildings, he expressed the wish that some modification might be made in the system then existing. Mr. Hill, the successor of Mr. Potter in the office, expressed similar views, but again without proposing a definite plan, and until now, although the higher officers of the Government, under whose care the Supervising Architect's office is placed, seem to have been always well disposed toward the idea of infusing more artistic interest into public buildings, no practicable method of doing so seems to have been yet devised.

THE fact is, as Mr. Bell well shows, that the building operations of our Government are not, and cannot be, for many years yet, carried on with the attention to their artistic beauty that would be given them in Paris or Rome. The system of administration under which they must for the present be built resembles rather that by which the French colonies, for instance, are governed than that which would be applicable to the great cities at home. Just as in Cochin China and Tonquin it is now necessary to build custom-houses, prefectures and barracks as speedily as possible, without spending unnecessary time in studying, for the sake of artistic variety, deviations from a good standard plan, so in this country, where custom-houses, post-offices, and United States court-houses are multiplying at the rate of about three a month, the importance of retaining their design, as well as their construction, under the control of an officer perfectly familiar with the requirements of each case, and able, through this familiarity, to turn out suitable drawings and other documents with all possible expedition, is very serious, and it may be doubted whether, even if all Government buildings could, by enlisting the emulation of all the architects in the country, be made models of artistic beauty and interest, the advantage of this would not be counterbalanced by the delays and interferences with a well-organized system which would often be the consequence. The French, fond as they are of artistic architecture, decided long ago that the administration of new colonies gave very little place for it, and adopted a plan of attaching one or more architects permanently to the official staff in charge of the colony which resembles in many respects the system of attaching an architectural bureau to the Treasury Department which has, in general, worked so well here.

IN regard to the great Government buildings at Washington the case is different, and the members of Congress, as well as the heads of the Executive Departments, seem quite inclined to think that, as haste is less necessary in remodelling the old buildings at the Capital than in providing new ones for places which have previously had none, it is wise to take advantage of the opportunity for spending a little additional time in securing new ideas of design, as well as for giving that recognition to the attainments of the architectural profession in the country which circumstances seem to preclude in other cases, and it appears to be generally agreed that such works as the Congressional Library, the rebuilding of the Patent Office or the extension of the Capitol, should be made the subjects of competitions among architects, similar to those by which designs for great public buildings are obtained abroad. Later, when the Government has occasion to build structures of a more strictly artistic character, such as monuments of any kind, there is no doubt that the aid of the profession at large would be always called in; and it is not impossible that the best solution of the question of the participation of architects in general in public work may lie in the direction of improving the details of competitions for the designs of structures of these two sorts, so as to enlist the attention of the best men in the profession; adding, from time to time, to the class of competition buildings, such of the structures to be erected in the great cities as experience might show to be best suited to the purpose. In this way it would be possible to secure for the more important public buildings that artistic character which all cultivated persons feel to be desirable, without throwing overboard at once the invaluable stock of experience and administrative detail which has been accumulated in the Supervising Architect's office, and, although the opportunities for

displaying the best professional attainment of the country would be less frequent than if all Government work were thrown open to competition, those which were offered might be made so brilliant as to compensate for their rarity; while, if the excellent recommendation should be adopted which was made last year by the Commission to examine the Treasury Department, that several architects of the highest standing should for the present be employed at adequate salaries to design for the Government under the guidance of the Supervising Architect, as the administrative head of the Bureau, it can hardly be doubted that a man as able and devoted to his noble profession as most of those have been who have already occupied the office would be able to make of his Bureau not only an object of ambition for architects of the highest training, but a conspicuous centre of that architectural art which is now so rapidly developing in this country.

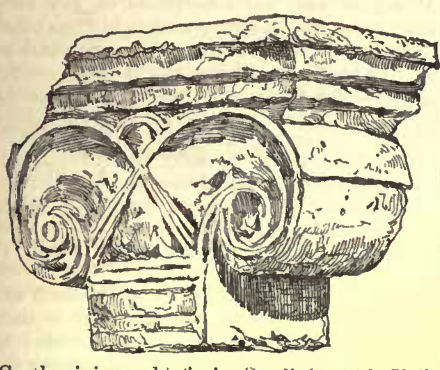
THE New York Court of Appeals has recently decided a case involving a building contract, confirming the decision of an inferior court. The New York *Daily Register* gives a rather meagre report of the case, but there are several interesting points in the decision. The circumstances seem to have been that a certain builder contracted in the usual form to erect a house under the direction of a firm of architects, and with the ordinary stipulation that no payment should be made until a certificate of the architects that the payment was due had been presented to the owner. There was another provision in the contract to the effect that disputes concerning the construction or meaning of the plans should be decided by the architects, but that any other difference between the parties should be submitted to the arbitration of two competent and disinterested persons, to be selected in a specified manner; and a forfeiture for delay in completion was also agreed upon. The house was not completed for four months after the contract time, but the owner then moved in. The builder applied to the architects for a final certificate, but was told that the owner had instructed them to give no more certificates. He then went to the owner, who pointed out some little matters still remaining unfinished, and told him that when those were done he would pay at once the balance due, after deducting the amount of the forfeiture for delay. It would seem that this promise was not fulfilled, for the builder subsequently brought suit for his money. The defense claimed that the certificate of the architect was agreed to be a necessary prerequisite to obtaining payment, so that the owner was not bound to pay anything until this had been produced; and, as the builder failed to bring the certificate, he had no right of action against the owner for refusing to pay.

MANY decisions show that under ordinary circumstances this is an unanswerable argument, but in the present case it was not disputed that the owner had instructed the architects to give no more certificates, and the court held that the owner, who had introduced the stipulation in regard to certificates into the contract for his own benefit, might waive it, and that, "if he accepted the house as under a completed contract, the plaintiff would be entitled to recover, although no certificate had been given, and even if the architect was not satisfied." Another point was made by the defence, that, as the contract provided that all differences not relating to the construction of the plans should be decided by arbitration, this stipulation should have been complied with before bringing suit. In regard to this the Court held that it was no more the duty of one party than of the other to resort to arbitration, and as the defendant, so far as was shown, took no steps toward the selection of arbitrators, it was unnecessary to consider this defence. The questions which the jury was called upon to consider were two in number, the first being whether the owner accepted the house as a completed building under the contract; and whether, if it was so accepted, the delay in its completion was caused by the owner's fault. What was the jury's decision we do not know, but the Court of Appeals held that these questions were properly submitted to it, and confirmed the verdict. The case is called Smith *versus* Alker, and seems to have been decided some time in March last. It is worth observing that the ground on which the jury decided that the owner had virtually accepted his house as complete seems to have been rather his promise to pay the contract price when certain small alterations had been made than his occupancy of the building. It has been decided more than once, we think, that the owner's moving into a new house does not constitute an acceptance of it, but in the present case the fact of his moving in, coupled with the assurance to the builder that he would pay the balance of the price, less deductions for delay, as soon as some small matters had been attended to, seems to have been regarded as a virtual acceptance from which he could not retreat subsequently without good reason.

IT is pleasant to know that the pedestal for the New York Statue of Liberty is now practically completed, and, what is more, the money to pay for it has been so nearly raised that it is thought that the proceeds of an entertainment, to be given soon by the Twenty-second Regiment, at the Madison Square Garden, will make up the full sum needed. As soon as the pedestal is ready, the work of erecting the framing which supports the statue will begin, and early in May, on the arrival of the French expert, the copper plates of the statue itself will be put in position, so that by midsummer we may expect to see the gigantic figure finished. Considering the quietness with which the committee has conducted of late its operations for raising funds, it seems to have been surprisingly successful. The simple sale of statuettes at a dollar apiece could hardly have brought in a very large income, especially as the bills for extensive advertising had to be paid out of the profits, and we are disposed to think that the members of the committee, together, perhaps, with some of their friends, may have made generous contributions for the sake of pushing the work to completion during the present season. Notwithstanding the efforts made to secure subscriptions from other cities and States, New York seems to have furnished much the largest part of the total sum, and, now that the affair is over, it may well be proud of having done so. For New York, on the ground of being the largest city in America, to claim that the whole country ought to help it to pay for a pedestal for a statue to ornament its harbor, never seemed very magnanimous, and we are glad that local pride, of which there is very little in New York, should have been at last to some extent awakened.

THE people of Florence maintain bravely their reputation for pride in their city, and earnest desire to make their public works conspicuous for all good qualities. Our readers will remember the way in which the Cathedral, intended, when begun, to be "the most beautiful building in the whole world, and the most worthy of Florence," was completed, after the poverty of the Florentines had compelled them to leave it without a front for four hundred years, by the generosity of an Englishman who bequeathed to the city the money necessary to finish it; and most of them will, perhaps, also remember the curious anxiety to get the best possible effect which led the building committee to take a popular vote as to the method of terminating the front, after setting up temporary models for the citizens to study. The front is now very nearly finished, and a new competition has been announced, open to all artists residing in Italy, for designs for the three bronze doors with which it is to be furnished. The subjects to be represented on the doors must relate to the Virgin Mary, but otherwise the choice is left to the discretion of the designers. Each competitor is required to submit a geometrical elevation, shaded in black and white or tint, at one-third the full size, together with a model in relief, at the full size, of some important part of the composition. The competition closes on the thirty-first of next October, and the designs are to be exhibited in public for a month before being submitted to the judgment of the expert jury. The stipulation is made that the jury is to be at liberty to make a separate choice for each door, so that the three selected designs may be all by the same artist, or by two or three different ones. It is quite uncertain when money enough for executing the doors will be available, and the Commission, although recognizing the right of the authors of the best designs to be entrusted with the work of carrying them into execution, makes no engagement as to the time when they will be called upon to do so, but for the present a premium of eight hundred dollars is to be paid to the author of the best design for the central door, and of six hundred dollars to those of the best designs for the two side doors; and it is agreed that whenever the time arrives for completing the work ten thousand dollars shall be paid for the finished model of the central door, ready for casting in bronze, and seven thousand dollars for the model of each side door.

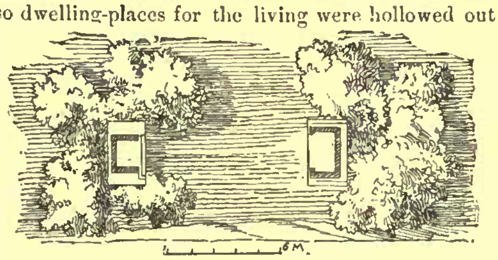
ART IN PHŒNICIA AND CYPRUS.[1] — III.



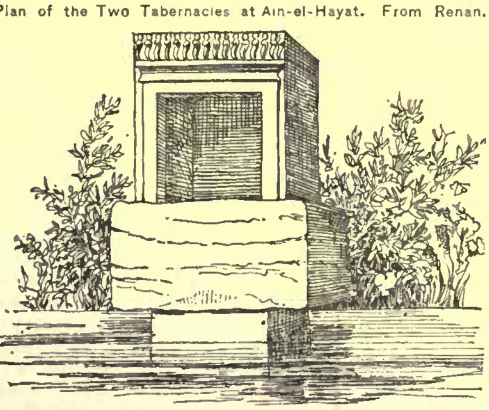
If the relics of Phœnician art are scarce in the mother country they are just as rare in the greatest of her colonies — in Carthage. For here, too, building and destruction and reconstruction more than once followed one another. We must look for relics of the earlier Phœnicians chiefly in Cyprus and Greece and the adjacent islands, and for relics of the Carthaginians chiefly in Sardinia and Sicily and Italy. Yet, sufficient indications may be gathered on the main Phœnician coasts to furnish clues and guides for the correct attribution of existing works wherever found. And occasionally, as at Eryx, the marks of Carthaginian masons have been found on stones that are still in place, and now and then a minor work of art has been unearthed bearing a Phœnician inscription.

The originality of this art consisted, as has been said, "chiefly in its lack of all originality," chiefly in its constant combination of elements received from Egypt and from Assyria. But the composite stamp thus given to its products is unmistakable to the practised eye, and it is a stamp, moreover, which all objects, even of late Phœnician manufacture, retained with singular persistence. The Greeks soon emancipated themselves from its influence, but it was otherwise with such communities as those of Cyprus and Judea. Here the composite Phœnician type was modified, it is true, but never replaced by another — not even when their uncreative, assimilative instinct had caused them to absorb a great deal from the art of Greece itself.

To speak now very briefly of Phœnician architecture. The first work of the tribes who settled on the Syrian coast — a mountainous coast with soft calcerous stone cropping up everywhere through the soil — seems to have been to excavate rather than to build. Not only tombs but also dwelling-places for the living were hollowed out of the stone. Thus, to quote M. Renan, "one of the most curious of the remains at Amrit is a monolithic house cut entirely from a single mass of rock. The material was cut away in such a fashion that only thin walls and partitions were left adhering to the soil. The principal façade is one hundred feet long. The depth of the house is about the same, the height of the walls is about twenty feet, and their thickness about thirty inches." At least three chambers were formed by partitions left in the same way, but one external wall was artificial, and another was partly formed of masonry. Tombs, a small temple, cisterns, silos, and the containers of wine-presses have also been found thus hollowed out of the soft rock, the surface of which was sometimes coated with stucco. "Building proper was only turned to in the last extremity, when there was no rocky site available. But by its very nature rock could only be used for the substructures of buildings. . . . The idea of finishing the work with cut stones must soon have occurred to the builders. . . . At first it was a mere question of adding a little here and there to the rock-cut walls, and the larger the applied masses the better were those early constructors pleased with their work. Their point of departure was what has been called *monolithism*, and from it the Syrian and Phœnician builders never shook themselves entirely free." They always used in their walls the largest stones they could find, without attempting to give them regularity of proportion, and then filled in as needed with smaller units. Moreover, they never grasped the idea which ruled in Greek construction, the idea that "not more than one member should be combined with each constructive unit. In Syria the architectural idea and the constructive units did not preserve this logical connection; when the Phœnicians made use of the column they, like the Assyrians, carved it all, shaft and cap, from a single stone." To this fondness for using stones just as they came from the quarry came the habit of employing what to-day is called "rustication"; the edges of the joints were dressed, but the rest of the wall-face was left rude. This habit, however, was not so distinctively a mark and sign of Phœnician workmanship as has sometimes been believed — while their love of units of huge size was in truth a persistent trait. No brick structure has been found in the mother-country which can possibly date from before the Roman period — a result, of course, of the abundance of easily-worked stone; for elsewhere, where this last was not so abundant, they seem to have built in the Assyrian fashion.

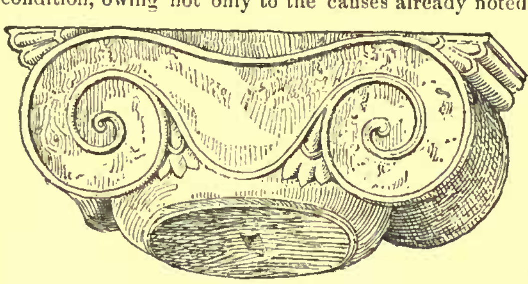


Plan of the Two Tabernacles at Ain-el-Hayat. From Renan.



Monolithic Tabernacle at A'in-el-Hayat. From Renan.

The chief remains which the disasters of centuries have left standing in Phœnicia are "sepulchral pits, small buildings resembling not a little in solidity and in appearance the rocks of which their bases form a part, fragments of walls, cones and pyramids raised upon tombs, and monolithic chapels." Even most of these are in very bad condition, owing not only to the causes already noted, but to earthquakes and to seeds of destruction latent within themselves; for the desire to use large stones meant that they were often bedded the wrong way, and that they were often intermingled with small stones to a degree and in a fashion which proscribed solidity. The Greek, building better though with far smaller units, insured to his work a much longer immortality.



Capital from Kition, cut from the local stone. Height, 18 inches.

"Another characteristic of Phœnician architecture is to be explained by its early predilections. Born of the living rock which it fashioned in a hundred ways, on which it reposed, which it continued and prolonged, it had no liking for any kind of open construction, and especially made slight use of pier and column. Very few fragments of columns, and those very small, have been found amid the ruins of truly Phœnician buildings. A study of these remains brings out the fact that columns were almost always used as ornamental motives in the form of pilasters. They did not support the roof and framework of the building as in Egypt and Persia and Greece." Moreover, the vault, too, was unused by Phœnician builders. Unknown to them it could not have been, seeing that Assyria had so potent an influence upon them in other ways. But only a few minor structures, and these not earlier than the time of Alexander, show any trace of the voussoir — another fact which is perhaps to be attributed to a persistent love of large constructive units as well as to the mere facility of obtaining such.



Alabaster Slab. Louvre. Height, 24½ inches.

To return to the column: when used it seems to have been without base, and without flutings to the shaft, and without, as has been said, any constructive separation of shaft and capital. The capital often bears a close resemblance to the Grecian Doric, and often to that which Vitruvius describes as the Tuscan, but modifications, sometimes extremely florid, of the type which we know as the Ionic, are also frequent and rude indications of the Corinthian; and there are other varieties of many kinds. Some of these (though our authors do not note the resemblance) seem more akin to Byzantine forms than to anything that prevailed in classic days. Occasionally the abacus is as deep as the bell and is ornamented with rows of chevrons divided by fillets that are curiously Norman in feeling. And these chevrons occur even when Ionic motives dictate the general shape of the capital. These more florid types come from Cyprus and are pictured from examples in the Louvre or in Ceccaldi's "*Monuments antiques de Cypre.*"

It was probably the voluted capitals that were used in metal supports or on wooden columns overlaid with metal, "In Phœnicia, as

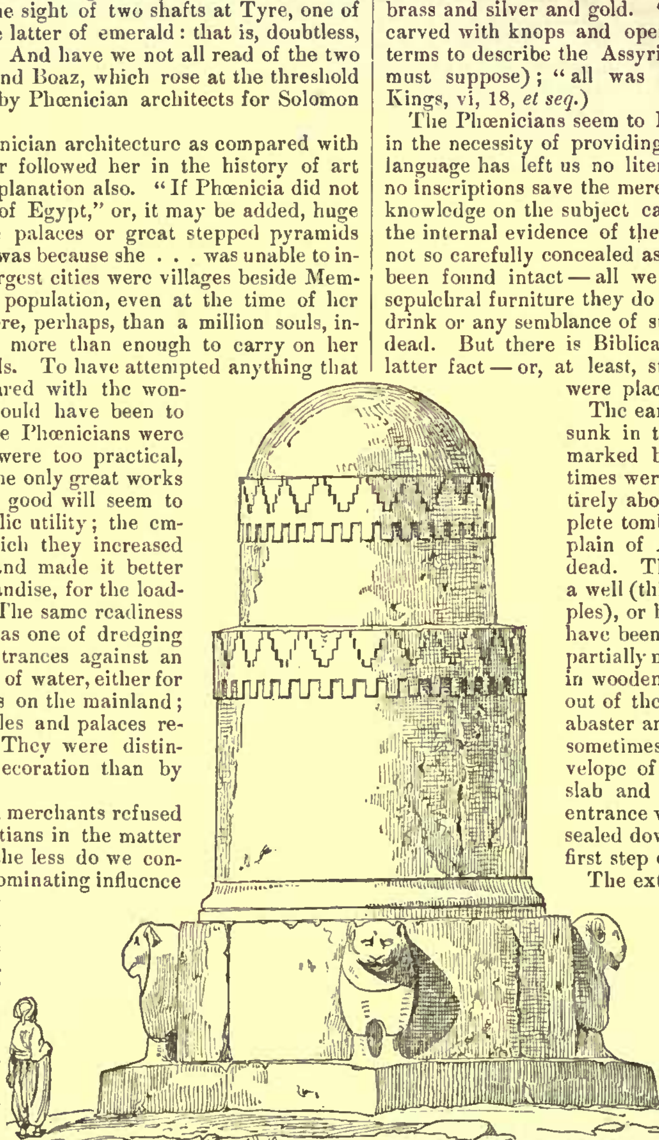
[1] *History of Art in Phœnicia and its Dependencies.* From the French of George Perrot and Charles Chipiez. Translated and edited by Walter Armstrong. In two volumes, illustrated. London, Chapman & Hall, Limited. New York, A. C. Armstrong & Son. 1885. Continued from No. 535, page 148.

in Egypt and Chaldea, these slender shafts must sometimes have been employed, as, for instance, in the support of the salient parts of the building or of porticoes."

Besides these, isolated columns were employed, like the obelisks of Egypt, for mere purposes of decoration. No examples are extant, but they are pictured on the coins of Cyprus, and are frequently mentioned by Classic authors as rising in couples before the sanctuaries. In the temple of Melkart at Gades, Strabo tells us, they were of bronze, eight cubits high, and bore a long inscription, and Herodotus describes his astonishment at the sight of two shafts at Tyre, one of which was of pure gold and the latter of emerald: that is, doubtless, of lapis-lazuli or colored glass. And have we not all read of the two great bronze columns, Jachin and Boaz, which rose at the threshold of that temple which was built by Phœnician architects for Solomon in Jerusalem?

The general poverty of Phœnician architecture as compared with those lands which preceded or followed her in the history of art should now be noted, and its explanation also. "If Phœnicia did not build hypostyle halls like those of Egypt," or, it may be added, huge terraces crowned with massive palaces or great stepped pyramids like those of Mesopotamia—"it was because she . . . was unable to indulge in such luxuries. Her largest cities were villages beside Memphis and Thebes and Sais; her population, even at the time of her greatest prosperity, was not more, perhaps, than a million souls, including slaves. It was hardly more than enough to carry on her industries and to man her vessels. To have attempted anything that could be even remotely compared with the wonders of Luxor and Karnak would have been to squander her vital forces. The Phœnicians were too economical, their intellects were too practical, for such ambitions as these. The only great works to which they turned with real good will seem to have been such as were of public utility; the embankments, for instance, by which they increased the actual superficies of Tyre and made it better fitted for the storage of merchandise, for the loading and discharging of ships. The same readiness was shown when the question was one of dredging the harbors or closing their entrances against an enemy; or of providing a supply of water, either for maritime Tyre or for the towns on the mainland; but, so far as we can tell, temples and palaces remained comparatively small. They were distinguished rather by wealth of decoration than by magnificence of plan."

"But although the Phœnician merchants refused to follow the lead of the Egyptians in the matter of splendid architecture, none the less do we constantly encounter proofs of the dominating influence exercised by Egyptian art over that of Phœnicia. To be convinced of this we need only glance at their details. . . . In what little remains to us of the works of Phœnician builders, it is the taste of Egypt that is to be recognized in the choice and arrangement of the ornamental motives."



Tomb at Amrit. Restoration in perspective. From Renan.

The Egyptian "gorge," for instance, almost always identical in section with the examples to be found in the Nile valley itself, seems to have been almost the sole device used in Phœnicia for the completion of the wall. Sometimes it is crowned by a row of *uraei*, each with a solar disk upon its head. Again, the openings of doors were surrounded by flat architraves, the lintel being adorned with the winged disk of Egypt. But with this a motive was constantly associated, which seems to have been of similar import but of local origin — a disk enclosing a ball. Wherever, say our authors, this motive is found, and on whatever object, it may be accepted as the sign-manual of Phœnicia. The sphinx, too, was imported from Egypt but modified in the act. Almost invariably it was given wings of that peculiar kind whose upturned ends are familiar in the monuments of Assyria. And this hybrid Egypto-Assyrian sphinx is another sure evidence of Phœnician workmanship. From Assyria, only, however, came the palmette and rosette and interlacing, tree-like patterns which constantly occur, and also the stepped ornament which in Mesopotamia was originally a constructive feature, but which in Phœnicia is persistently applied in decoration, even down to the Roman period. Thus all the Phœnician's decorative motives were borrowed either from the south or from the east, but all, either by alteration or by association with those of different origin, were given a new accent by which the works where they occur may easily be distinguished from the truly Egyptian and the truly Mesopotamian. It should be added that the hieroglyphs of Egypt — which even in our eyes have a singular decorative value — appealed no less than purely ornamental motives to the borrowing Phœnician, and no less than these were altered by his hand. The individual signs may be truthfully copied, bu', their sense being unknown to him, becomes nonsense under his touch. Phœnician hieroglyphics are ornamental merely, and are one of the most valuable aids, as may easily be imagined, towards the right attributing of any object upon which they occur. As the soft stone of Phœnicia was not susceptible of any very delicate ornament and finer stone was but rarely brought from other countries, the builder constantly employed sheathings of metal or wood and painted decorations to complete his work. The sheathings have everywhere disappeared, but the fact of their use is evident, for example, from the forms of many Cypriot capitals. And, once more, have we not the language of the Bible to prove how the temple of Jerusalem was overlaid with panelling of cedar and coverings of brass and silver and gold. "And the cedar of the house within was carved with knops and open flowers" (we could hardly use better terms to describe the Assyrian and Egyptian motives whose use we must suppose); "all was cedar; there was no stone seen." (I Kings, vi, 18, *et seq.*)

The Phœnicians seem to have believed in the life after death and in the necessity of providing in some sort therefor; though as their language has left us no literature and their tombs have yielded up no inscriptions save the mere names and titles of the deceased, our knowledge on the subject cannot be supposed very full. Nor does the internal evidence of their sepulchres tell us much. They were not so carefully concealed as in Egypt; none of ancient date have been found intact — all we can say is that while they contained sepulchral furniture they do not seem to have contained any food or drink or any semblance of such for the figurative nourishment of the dead. But there is Biblical evidence which strongly disputes this latter fact — or, at least, strongly suggests that offerings of food were placed on the grave, if not buried within it.

The earliest tombs in Phœnicia proper were pits sunk in the rock. But these seem to have been marked by monuments above ground, and sometimes were replaced by rock-like constructions entirely above the level of the soil. The only complete tombs yet found in the country stand in that plain of Amrit where the Arvadites buried their dead. The tomb-chambers are reached either by a well (this, apparently, in the most ancient examples), or by a staircase. Whole families seem to have been buried therein together, the bodies being partially mummified, wrapped in shrouds or placed in wooden coffins and then laid in niches hollowed out of the walls. A few dish-shaped coffins of alabaster and terra-cotta have also been found; and sometimes the corpse was protected by a thick envelope of plaster. The niche was closed with a slab and when the sepulchre was full the outer entrance was likewise secured — a large stone was sealed down over the mouth of the well or on the first step of the staircase.

The external features of the Amrit tombs were massive and lofty. The finest is pictured in our illustration — with its stepped Assyrian decoration and its roughly blocked-out lions. Another has a lofty monolithic pedestal standing on two steps and finished with a well-marked moulding composed of a *cyma recta* and a fillet. On this rises another large stone, its lower portion squared and its upper having the form of a truncated pyramid. In its original condition the pyramid was probably complete, and the height of the monument, consequently, greater than it is to-day — thirteen feet. "The peculiarity of this tomb lies in the fact that the entrance to the staircase is covered by a ridge roof, cut from a single block and supported laterally by a course of huge stones." As the visible monument stood over the burial-chamber proper, the entrance in each case lies, of course, some distance from its base. Near these tombs stands another which is also crowned by a pyramid, but covers no subterranean sepulchre — is itself the sepulchre, a cubical mass of masonry of which the stones are more than sixteen feet long and laid without cement. There are two chambers within, but the whole structure is very ruinous, owing not only to the action of earthquakes but also to its having been used at various times as a residence or fortress. As it stands to-day, without its pyramid, it is thirty-seven feet high and the pyramid may have added some sixteen additional feet.

M. G. van Rensselaer.

The Caisson Disease. — In a recent lecture on caisson disease, Dr. A. V. Meigs relates that a visitor once opened his brandy-flask while in the compressed air-chamber, and re-corking it, placed it in his pocket. When he got back to the outer air, the flask exploded with considerable violence. "No more telling story could be told," said the Doctor, "than that of the brandy-flask, to show what must occur with every liquid and gas contained within the human economy upon coming out of the air-chamber." While under pressure none of the workmen were attacked; but on leaving the chamber they were all "chilled to the bone," and their vital energies paralyzed. The men are now kept under strict medical control while doing this work, and the percentage of mortality is stated to have been very largely reduced. — *Exchange.*

THE SULTAN'S ART-TREASURY.



DESIGN FOR A PLASTER FRIEZE BY ALESSANDRO VITTORIA. (VENICE, LATTER HALF 16TH CEN.)

THE London *Times*, of December 8th, gives the following extracts from a letter of Mr. J. C. Robinson, who, thanks to diplomatic influence, has succeeded in exploring the mysteries which have so long lain secluded within the closed chambers of the Old Seraglio at Constantinople.

With the mystery of the unknown and undescribed, and the rumor of wondrous accumulation attaching to it, where in all the world could there be a greater attraction for the art-lover and the archæologist than the Sultan's treasure-house at Constantinople? To explore this mysterious repository had for years been the writer's cherished dream, and many and fervid were the golden visions conjured up in anticipation.

There are several other ancient royal treasuries still kept together in Europe. Those of the old Saxon princes in the Green Vaults at Dresden, and of the Austrian Emperors at Vienna, are the most noticeable. The English Crown, moreover, once possessed a similar accumulation of things rare and precious, but the treasures of the Jewel-house in the Tower of London shared the fate of the pictures and statues when King Charles I. lost his head. These old treasuries were, in reality, art-museums, the precursors of Cluny, the Louvre and South Kensington.

There was just one historic accumulation in Europe which had never had the light of day let in upon it, and Mr. J. C. Robinson has now violated even its privacy. Armed with diplomatic introductions and iradés, he has penetrated within the Old Seraglio at Constantinople. Our readers enjoy the first fruits of his investigation; and the primary effect of the report must be to dazzle them as the spectacle dazzled him. The spreading throne of beaten gold, set with a mosaic of many thousands of pearls, rubies and emeralds, will awaken bad passions in Turkish bondholders. They would not, like Mr. Robinson, condemn its gorgeousness as tasteless. In the same chamber is another imperial divan, in which a higher artistic conception is carried out by an expenditure as lavish of gold and gems. Everywhere are scimitars, armor and saddle-cloths encrusted with splendid jewels. The Sultan's treasury so ran over of old with precious stones that they were stuck by native workmen into gold tankards of foreign production. Ranged confusedly with modern French clocks and gaudy vases, are Oriental objects of "fabulous intrinsic value." Celadon-green china is there, as also blue and white. Imperial costumes of wonderful ancient textiles are to be seen. A kiosk of sixteenth-century work is lined throughout with finely-painted old Persian tiles. In another is the most delicate scroll-work. Gold inlay may be observed worthy of Cellini. The only class of art-workmanship in which the Sultan's treasury is deficient seems to be old European *bijouterie*, which is conspicuous by its absence. Mr. Robinson supposes that influential Pashas and ladies were more appreciative than Sultans. Probably Court favorites begged or borrowed the gold-enamelled snuff-boxes, Sèvres and Dresden services, and ormolu-mounted furniture and candelabra, which he is persuaded must have been presented to the Selims and Amuraths by their princely Christian allies.

Mr. Robinson mentions a belief that a mass of art-treasures exists stacked in lumber-rooms in the original cases, which have never been opened. Indolent and procrastinating as is the Ottoman nature, he cannot credit that its lethargy would so far master its cupidity. His theory is that Ottoman sovereigns have always been liberal donors as well as large recipients, and that the absence of last-century cabinet-work and porcelain is thus to be accounted for. He does not at all admire the generosity of the Sultans, and wishes they had been much more close-fisted. This profuseness in giving, doubtless, has robbed their Treasury of grander things than the glories of Sèvres and Meissen. Turkish Sultans had at their feet the choicest art-treasures of Greece and Rome. To them fell the right of taking and keeping the gems and cameos, the embroideries, the ivory caskets, the altar-ornaments, of which Constantinople, when they stormed it, was the last residuary legatee. All was at their disposal on the fatal day when Saint Sophia ran blood. A vast proportion of the world's artistic inheritance must have come into their actual hands. Every trace of it has vanished. Mr. Robinson would have been keen to mark relics of Classic jewelry or carving. They are so absolutely absent that, after the first hasty survey, he would manifestly have been simply amazed at the discovery of any. His regret and expressed surprise are reserved principally for the specimens of later art which he is sure ought to be there and are not. He was aware precisely of the age and character of the wares, and could have indicated where, according to their date, they should have been found in the collection. A master of the history of European art is as acutely sensible of such a void in a collection like this, into which art-deposits have successively tumbled, as a geologist, when the right strata do not follow one another. Mr. Robinson journeyed from one end of Europe to the other, in the distinct anticipation of the recovery of treasures which, with the eye of historical imagination, he saw stored by the Bosphorus.

He comes to the spot, and they have disappeared. Sympathy can the more easily be felt with his disappointment that his visit dispels the last faint hope, which others beside himself had cherished, of some exquisite wreckage, at least, from the Byzantine past. Until his practised scrutiny had been tried, there was always a possibility that all had not perished. He has been and looked, and that chance is at an end. Of *cobochon* gems, of dagger-hilts formed of single emeralds, and the like, there is an infinity. The pomp and magnificence of the barbaric East is there. Of the light and radiance of Greece there is nothing. Mr. Robinson had only leisure, or his escort had only authority, for a survey by him of the bindings of the manuscripts in the Sultan's library. So far as his personal evidence is concerned, it would be permissible to continue to fancy that the two or three thousand manuscripts may comprise the old Byzantine library, contemptuously neglected and safe. He will not allow of this shadow of a consolation for the destruction of all other things precious and beautiful, to which the Imperial Art Treasury negatively testifies.

The Constantinople library, as he says, excited in vain the eager curiosity of many former generations of Western scholars. As we recently pointed out, futile efforts three centuries back were made by Englishmen to clear up its mystery. Apparently nineteenth-century curiosity has the secret of a solvent, against which the locks of a Sultan's bookcases themselves are not proof. The presses have been ransacked by unknown trained and covetous hands, and visions of unedited classics imprisoned in the octagonal kiosk lie irretrievably shattered.

Mr. Robinson, while he laments the treasures which might have been there and are not, pronounces the accumulation full of costly rarities of a description to delight the ignorant tourist, with Oriental work interspersed of strange and novel types which would fascinate the art-specialist. To judge from this morning's account, the interest of the individual things is much more than of the collection. The collection is the result of pillage; but that is not the reason. A plunderer may rob with judgment, and stamp the whole with his own genius. Venetians pillaged as greedily as Sultans, and the fruit is St. Marks. The Mosque at Cordova is a perfect jewel of architecture; and it is a cento from a hundred devastated Classic temples. Venetians and Spanish Moors plundered with a method, and in order to reconstruct.

Turks plundered, in part because they were covetous, and chiefly from the mere thirst of destruction. They were ignorant, with the instinct of ignorance which creates a vindictive rage against knowledge and genius. The wonder is that the Sultan's Art Treasury preserves so much of beauty, rather than that it has no more. It represents a satiety of demolition and ruin as much as anything else. Its owners do not care to visit it; they grudge leave to strangers. If it include objects of beauty beyond armor, which a Turk may have understood, it is a happy accident. That the effect of the general mass should have been pleasant and informing, would have been miraculous. We have often deplored the dispersion of grand collections, whether of works of art or of books. In addition to the several lots which the buyers consign to as loving a guardianship as that they quit, there must be something nobody can purchase and appropriate. The collection as such, when due to real insight, possesses a spirit which the auctioneer's hammer puts to flight or dissolves.

The Sultan's Art Treasury evidently comprehends no spirit of the sort. It might be broken up to-morrow, and none but the keeper and his staff of thirty assistants would be at all the worse. That is, indeed, a fate which is to be desired for a large portion of its contents. They are doing no good where they are, and might do much elsewhere. The Sultan could not do a wiser thing than send his art-treasures to King Street and to the Hôtel Drouot. Thence they would flow into channels where their beauty might fructify, as it never will in Ottoman custody within the melancholy Old Seraglio. Turned into cash these lovely crystals, tiles, arms and gemmed flowers of Eastern fancy might at once cultivate Western taste and fill up clamorous gaps in the finances of Stamboul.

"The very mention of Constantinople, antique Byzantium, calls up impressions of an overladen past, transcending perhaps, in vastness and complexity, all other historic record. It was difficult, if not impossible, indeed, to conceive that in this centre and battle-field of the Eastern and Western worlds, and of old religions, the visible monuments of past epochs could be other than abundant and enthralling, or that historic trophies innumerable could there have failed to find abiding-place and reverence. The truth, however, must be said. Constantinople, intensely interesting and impressive withal, is but as an empty shadow of the past — a tomb, a field of burnt-out ashes. An earthquake-wave indeed might almost have passed over it, so completely have the myriad vestiges of olden things been swept away and scattered. Not, however, such fatality! Sufficient for this wreckage have been the twin-forces of fanaticism and ignorance. The Turk has spared one, and one only, capital monument of old Constantinople, and on that he has put a mark of horrid explanation: some eight or ten feet up on one of the inner marble walls of Santa Sophia, is shown the shadowy impress of an outstretched hand, imprinted of old in blood and faintly ensanguined still. To that height, it is said, the bespattered gore-stains rose when, four centuries ago, the Turk slew to the last man the shrieking crowd

of priests and people, who had taken refuge in the holy fane. Imagination still vivifies this vivid hand-print with a weird and dreadful energy, and one almost expects to see it move and trace in lines of blood or of fire, as at the Nineveh feast, an awful record of destruction, or the presage of a coming doom. Fit manifesto this of the destroying Turk! But surely the conquering hand had spared endless treasures of art; surely there yet remained in the Sultan's treasury wonderful relics of old Byzantine Cæsars — gold-mounted cups and vases of sardonyx and crystal, gems and cameos of ancient Greece. Here, too, if anywhere, that phœnix of antiquity, the Murrhine vase itself, might, perhaps, be found lurking in some obscure nook. Glorious jewelled crowns of conquered sovereigns, orbs and sceptres, silken robes with jewelled orfrays, golden armor, ivory caskets, diptychs and triptychs in rich-enamelled frameworks, mosaics and splendid pendent jewels, manuscripts despoiled from old Western libraries with gem-beset and gold-embossed covers, rich vessels of the altar even, trophies of the triumphs of Islam — who knows what else of rarity unheard of? Alas! of all of these the Sultan's treasury contains scarcely a vestige. The destroying hand of the Osmanli has broken, shattered, melted down, burnt — in a word, clean made away with all such ancient relics. The Sultan's treasury, then, of my imagination proved to be a dream only, a Barmecide feast, and the awakening blow was a severe one. . . .

"A high official, the Keeper of the Imperial Treasury, and a staff of no less than thirty sub-officers and attendants, were assembled at the unlocking of the door. This in itself was a picturesque, formal ceremony, apparently of prescriptive usage. The officers and attendants ranged themselves in two lines facing each other and leading up to the doorway, and a green velvet bag containing the massive keys was passed along to the principal official, who, in a solemn manner, took out the keys one by one, and apparently compared and verified them in the presence of a couple of coadjutors. When the outer wooden door was opened a massive barrier of wrought-iron was disclosed, crossed by several long bars or bolts, on which were hung heavy padlocks.

"One by one these were opened and removed and at last the ponderous gate swung upon its creaking hinges, and the well-guarded precincts were entered, on my part with expectation strung up to the highest pitch and with delightful feelings of child-world awe, as if it were a plunge into an enchanted sesame cave, from which there might perchance be no exit. Very cave-like and mysterious indeed is the first aspect of the three great, square, lofty rooms, *en suite* with each other, occupied by the collection. The rooms are dimly lit by grated windows high up in the walls, and a gallery with a low balustrade surrounds them at mid-height. The deep, old-fashioned glazed cases containing the bulk of the objects, especially those in the lower story, are thus quite in the shade.

"On the whole, the first room is the richest in notable objects. The most conspicuous, though by no means the most interesting thing is a great throne or divan of beaten gold, occupying the entire centre of the room, set with pearls, rubies and emeralds, thousands on thousands in number, covering the entire surface in a geometrical mosaic pattern. This specimen of barbaric magnificence was a spoil of war taken from one of the Shahs of Persia.

"Infinitely more interesting and beautiful, however, is another canopied throne or divan placed in the upper story of the same room. This is a genuine and most interesting work of old Turkish art, doubtless made some time during the second half of the sixteenth century. In shape not unlike one of the tall mosque pulpits, this throne is a raised, square seat, on which the Sultan sat cross-legged. At each angle rises a square, vertical shaft, supporting a dome-shaped canopy, with a minaret or pinnacle surmounted by a rich gold and jewelled finial. The back is panelled or closed in, as if by a cloth of estates, and there is a foot-stool in front for aid in ascending the high-raised seat. The entire height of the throne is nine or ten feet, the materials, precious wood, ebony, sandal-wood, etc., encrusted or inlaid with tortoise-shell, mother-of-pearl, silver and gold. The entire piece is decorated inside and out with a branching, floriated design in mother-of-pearl marqueterie, in the style of the fine early Persian painted tiles, wonderfully intricate and admirable in taste, and the centre of each of the principal leaves and flowers is set with splendid cabochon gems, fine balas-rubies, emeralds, sapphires, pearls, etc. Pendent from the roof of the canopy, and occupying a position which would be directly over the head of the Sultan when seated on the throne, is a golden cord on which is hung a heart-shaped ornament of gold, chased and perforated with floriated work, and beneath it again a hugh, uncut emerald of fine color, but of irregular triangular shape, nearly four inches in diameter and an inch and a half thick.

"The effigies of the Conquerer and his immediate successors are evidently not of the period, and one suspicious circumstance is that from the beginning to the end of the series, with the exception of poor Sultan Mahmoud's vile outer casing, there is scarcely any difference in the cut or fashion of the several garments. In short, these effigies of old Sultans — Mahomeds, Bajasets, Selims and Suleimans, who in the flesh flourished centuries apart, might be interchanged and shuffled about without the slightest appearance of break of sequence or incongruity. All the turbans are enriched with splendid jeweled plume ornaments or aigrettes, and each figure has a magnificent dagger inserted in the waistband. Every one of these splendid weapons is a masterpiece of art, and in these there is evidently considerable difference in age and origin. Some of them seem to be of Persian and Indian work.

"One splendid example has a hilt of chiselled steel, in perforated work enriched with gold inlay worthy of Cellini himself. The hilt of another is entirely formed by a huge single emerald. Other such hilts and scabbards are studded over with exquisite enamelled work, *cabochon* rubies, sapphires, emeralds and table-diamonds. In these details, as in the jewelled turban plumes, the profusion of splendid gems is absolutely bewildering. In one of the aigrettes I especially noticed, in rosette at the base of the plume three magnificent stones, two emeralds, and a balas, or spinel ruby, each of which cannot be less than an inch and a half across.

"Perhaps, after all, the most noteworthy thing about these costumes is the splendid assortment of fine ancient textile materials which they exhibit. All the caftans, or outer robes, are of magnificent figured brocades, the pattern of each a masterpiece of Oriental design, wrought out in fine silk, gold and silver, of texture rich and thick enough to almost stand on end by itself. The undergarments again are nearly all of figured silks of the most exquisite and varied patterns.

"In the third chamber, amid a vast accumulation of rare and costly things — arms, crystals, china and miscellaneous objects of Oriental origin — are undoubtedly scores of specimens which would furnish glowing and attractive descriptions for a catalogue, but I fear I have already dwelt too long on works the most notable characteristics of which are, after all, rather Oriental splendor and magnificence than art or historic interest.

"I must pass over with a few words only, visits to some of the other and older parts of the Seraglio buildings, notably to two detached octagonal kiosks of sixteenth-century work, entirely lined with finely-painted old Persian tiles, the woodwork in beautiful mosaics, or *intarsiatura* of colored wood, tortoise-shell and mother-of-pearls. In an ancient audience-hall is another great canopied divan throne of gilt and perforated enamelled metal-work; and a very curious chimney-piece, with a high, hanging, funnel-shaped hood, also of the same material and style, chiselled with floriated scroll-work in admirable taste, may be mentioned in passing. These are both works of the early years of the sixteenth century, and are certainly among the oldest and most interesting specimens of Turkish design now extant in Constantinople.

"Another of these kiosks, an octagonal, dome-shaped building, of no great size, contains the Sultan's ancient library, and here there remains to notice a yet somewhat unsolved mystery. Perhaps the books, some two thousand or three thousand in number, all in manuscript, have been critically examined by competent authorities, perhaps not. I could get no certain information on this point. It is said, at any rate, that some forty or fifty manuscripts from the library of Matthias Corvinus are still among them. The dumb-looking tomes are all enveloped in outer leather cases, and they are arranged in vertical piles one upon another, not in horizontal rows. Once upon a time this roomful of books was the cynosure of all the learned men in the world, for there was a rooted belief that this was the veritable library of the old Byzantine Emperors, which had escaped the destruction of all things precious and beautiful at the taking of Constantinople. Here, if anywhere, it was supposed were the inedited classics of Greece and Rome, complete and all-eloquent, ready to burst their very bindings with desire to speak again to the modern world. The Lorenzos and Politians, the Bembos and Scaligeri fretted and fumed and yearned to solve this mystery, but in their days no Christian footsteps could enter these precincts. Even Louis of France, the great be-periwigged, and his forty immortals, failed ignominiously when they tried, two hundred years ago, to get access to these renowned books. I fear, however, all this was but a brightly-tinted bubble which swelled till it burst, or, perhaps, it may have lasted till some mere peripatetic book-hunter pricked it furtively in our own time, for it is now, at least, understood that there are no inedited classic manuscripts in the Sultan's library, nor any remains of the old Byzantine Palace-books. Probably there are well-informed book-lovers who could let us know what there really is of value in this famous repository. For myself, I saw the outer husks and bindings only."

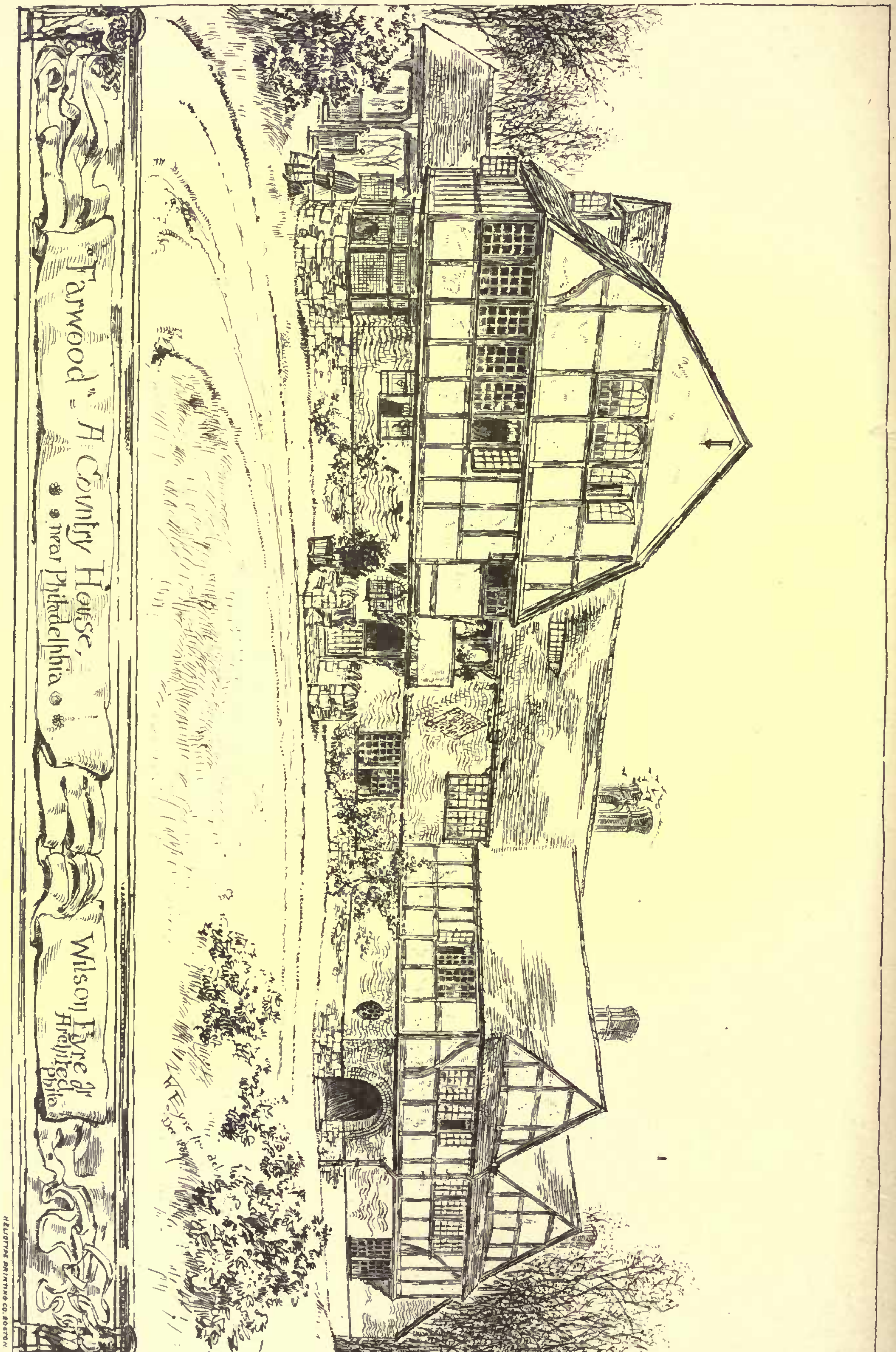
THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

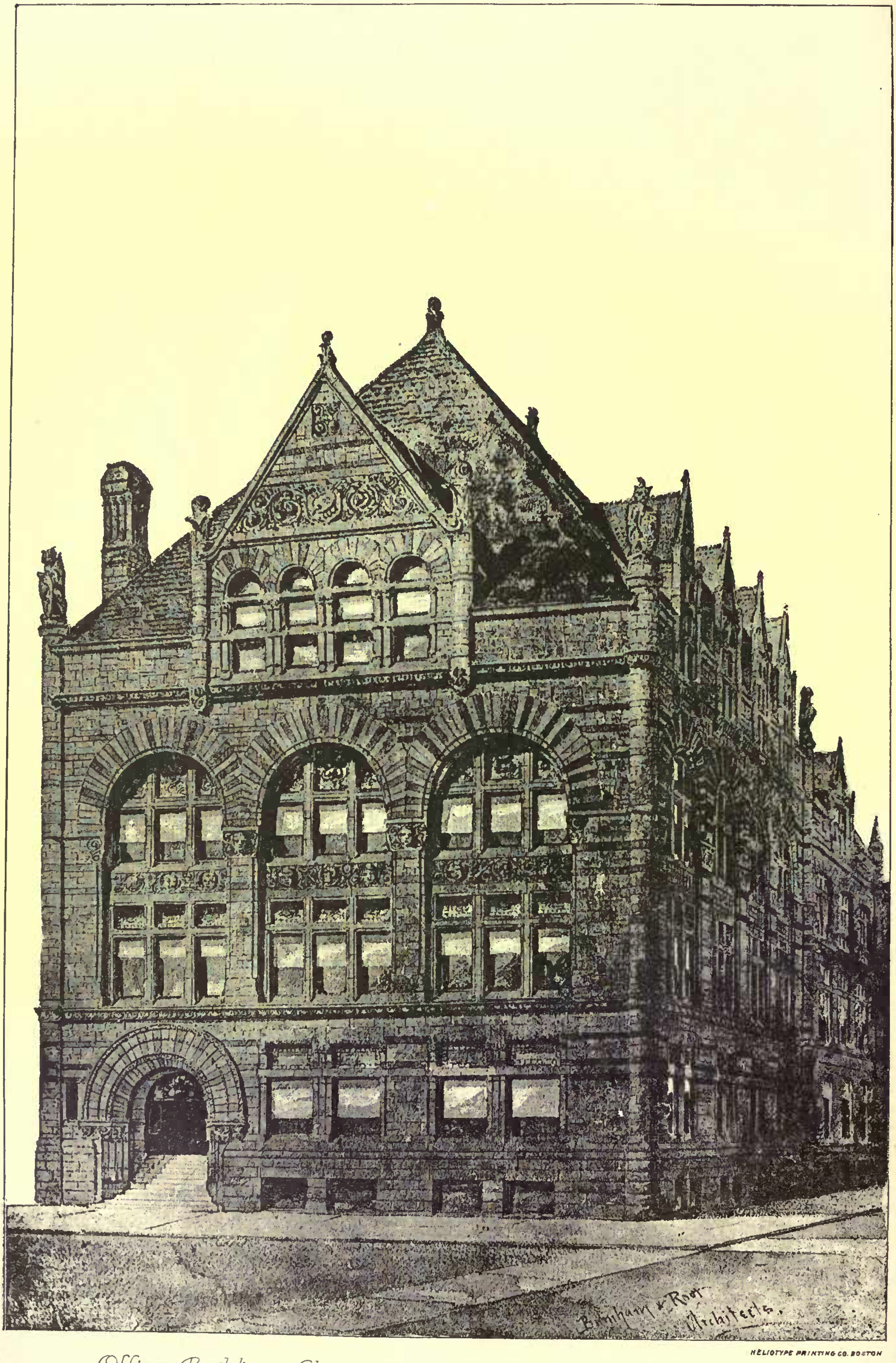
TREMONT BAPTIST CHURCH, TREMONT, N. Y. MR. FRANK F. WARD, ARCHITECT, NEW YORK, N. Y.

THE exterior is of a local stone, a kind of bastard marble. The gables are covered with shingles, stained. The interior is of ash and whitewood, the whitewood stained; open timber ceiling. The sashes between lecture-room and auditory are made to slide up. The cost, complete, was $7,000.

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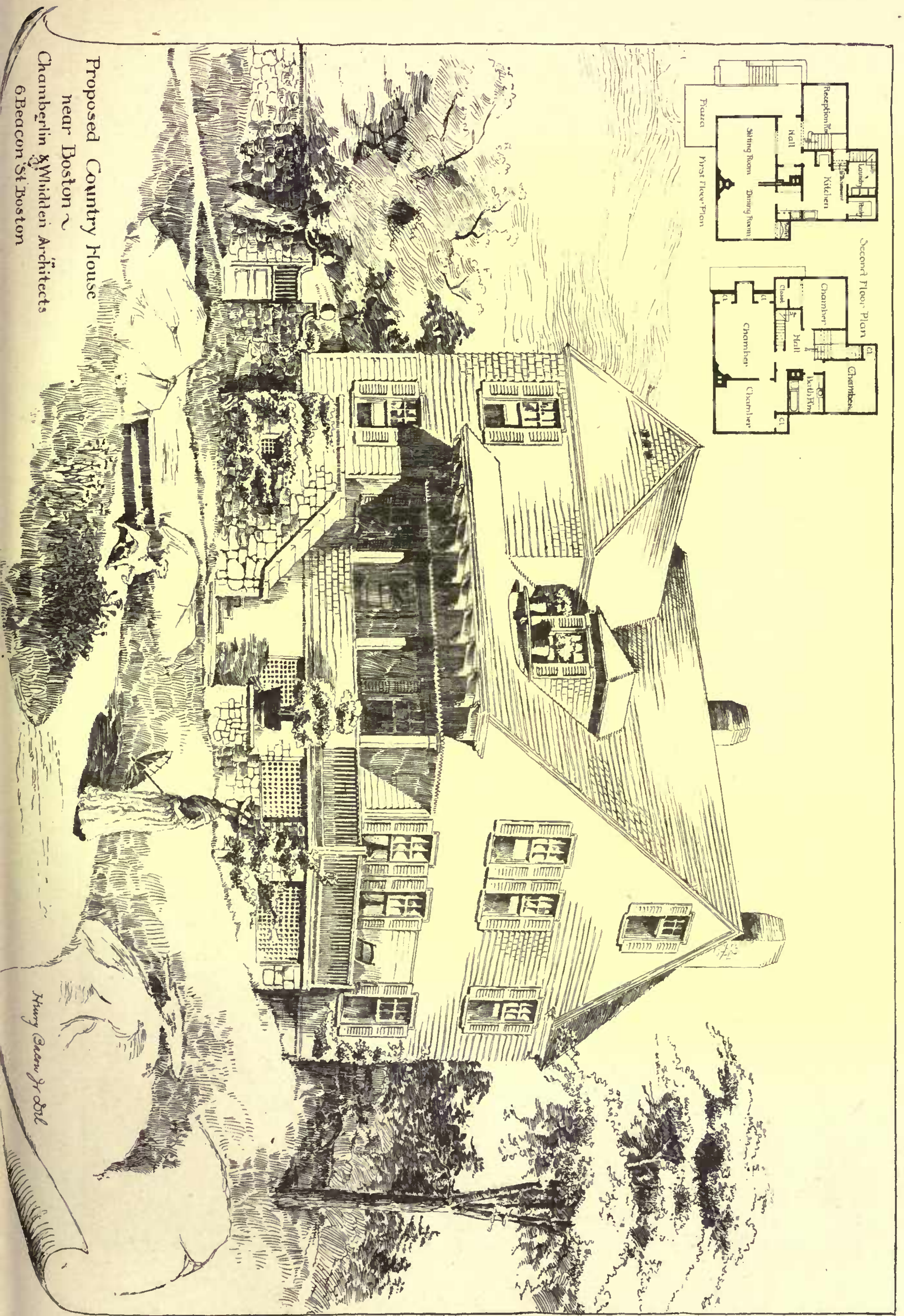
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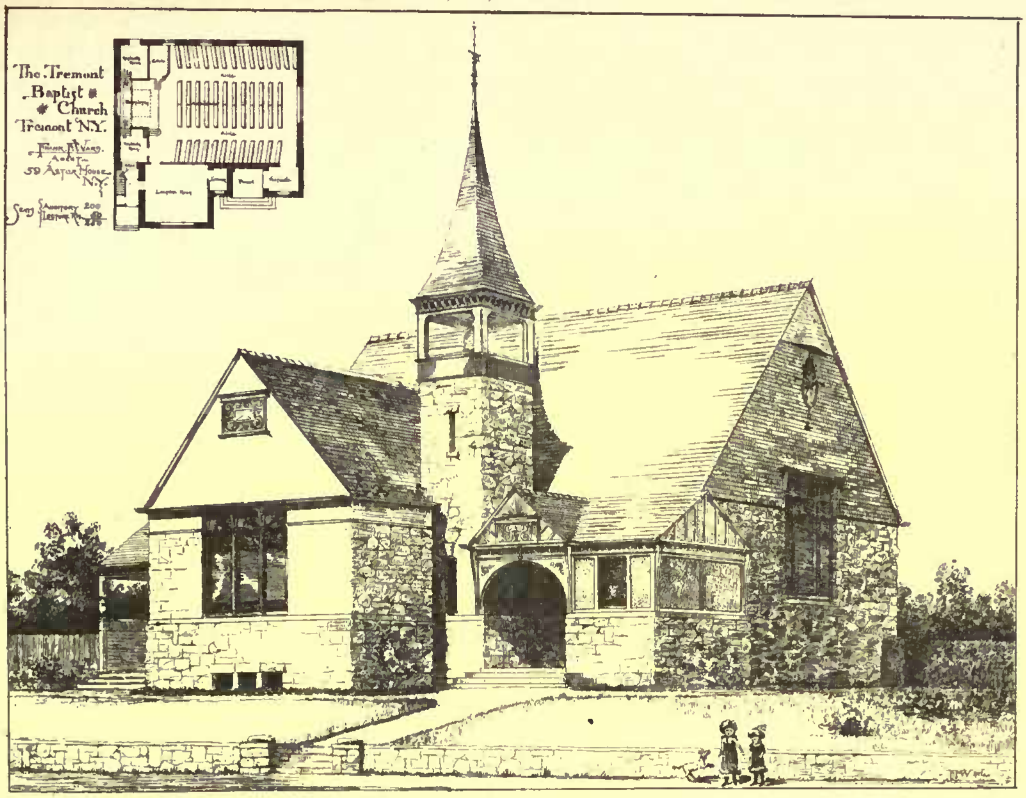
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House of Francis B. Hayes. Lexington, Mass. — J. Ph. Rinn, Archt.

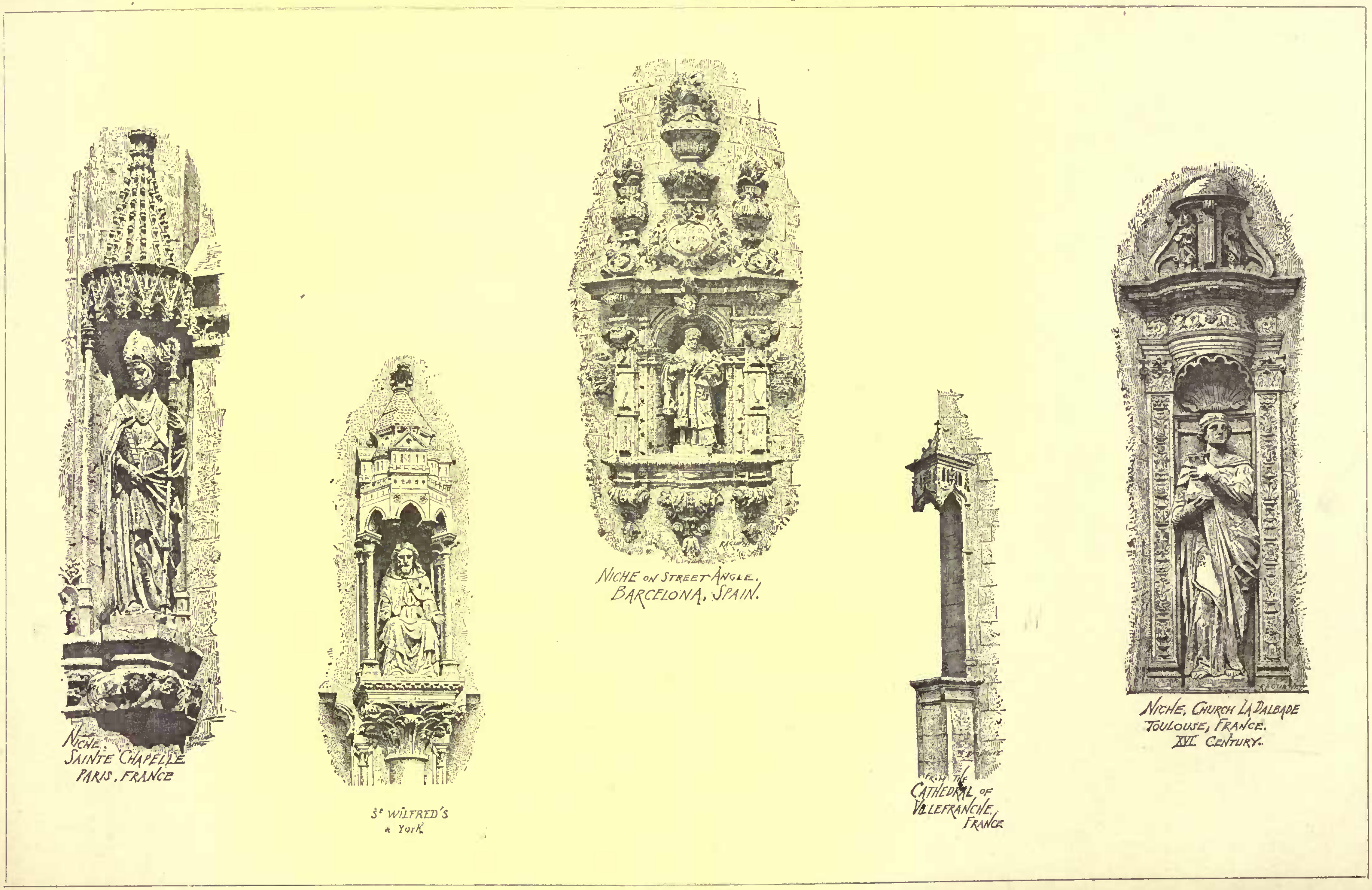
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Niche, Church La Dalbade Toulouse, France. XVI Century.

NICHES.

ROTCH TRAVELLING SCHOLARSHIP DRAWINGS. — PLATES V, VI, VII, AND VIII.

[Issued only with the Imperial edition.]

COMPETITIVE DESIGN FOR THE CINCINNATI CHAMBER OF COMMERCE. MESSRS. BURNHAM & ROOT, ARCHITECTS, CHICAGO, ILL.

AN OFFICE-BUILDING, CHICAGO, ILL. MESSRS. BURNHAM & ROOT, ARCHITECTS, CHICAGO, ILL.

THIS and the preceding drawing were shown at the recent exhibition of architectural drawings in Boston.

"FARWOOD," A COUNTRY HOUSE NEAR PHILADELPHIA, PA. MR. WILSON EYRE, JR., ARCHITECT, PHILADELPHIA, PA.

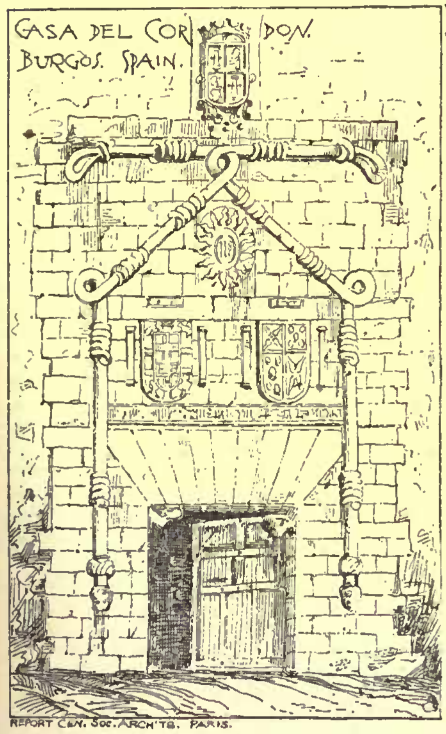
THIS drawing was also shown at the Boston exhibition of architectural drawings.

A COUNTRY HOUSE, NEAR BOSTON, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

HOUSE FOR THE LATE FRANCIS B. HAYES, LEXINGTON, MASS. J. PH. RINN, ARCHITECT, BOSTON, MASS.

A SKETCH MADE AT MARBLEHEAD, MASS., BY MR. PIERRE G. GULBRANSON.

HEATING AND VENTILATION OF SCHOOL-ROOMS.



THAT too little attention is given to important matters of heating and ventilating public buildings, particularly school-rooms, is a great fact which is at last becoming recognized; and it may be hoped that the following article will lead to some improvement where it is shown that old methods are so much at fault. The tests were made by Mr. Nathaniel Morton, of Plymouth, Mass., and will reveal to parents a state of affairs they have little suspected. The specimen tables do not show the worst results learned, but from them it can readily be perceived that when children are confined for hours where their feet are in a temperature but little above freezing, there is small chance for mental improvement and far greater chance for contracting colds or other forms of disease. We hope the article will be attentively read. Mr. Morton says: —

Surprise at the great difference found in the temperature of a room at five feet above the floor and at the floor, led to making tests of the temperature of the air of fourteen school-rooms in the town of Plymouth, three times a day for the three weeks from January 26, to February 13, 1885. Three thermometers were hung in each room, on light tripods, the bulbs of the thermometers being five feet, three feet, and two inches from the floor, and so placed in each room as to be out of the direct influence of the sun and heating apparatus, and not near to any window or other opening, nor near the outside wall. The thermometers for each room were selected to read alike at the same height from the floor. The readings of the thermometers in each room were taken soon after opening school and just before recess in the morning, and before recess in the afternoon. The temperature of the outside air was recorded at the same time each day. All apparent errors in the records have been omitted. The tables on the following page are copied from the record taken by the teacher.

The rooms found to be heated the best (which are supposed also to be ventilated the best, although no tests were made of the purity of the air), are the three rooms which are heated by furnaces, ventilated by chimney exhaust-flues with openings near the floor and fresh air supplied automatically at the ceiling when the air from the furnace is not sufficient to supply the place of the air taken from the rooms by the exhaust flues. In these three rooms an average of forty-one tests to each room shows an average difference in temperature between the air at the floor and at five feet above the floor of less than eight degrees, the average outside temperature being twenty-two degrees.

The rooms found to be the most unevenly heated are those with low (nine feet) ceilings, heated by stoves with long pipes, in which the fire is not kept over night, and not made until one or two hours before opening school in the morning. Such rooms may be very warm at the height of the head of the teacher, and be near freezing point at the feet of the scholars. In such rooms, when the outside temperature is near zero, over thirty degrees difference in temperature has been found between the air at the floor, and the air at the height of five feet. It is near noon before such rooms get properly warmed. A remedy would be to keep the fires through the night, or make the fires much earlier in the morning, to get all of the air in the room thoroughly warmed before beginning school. This was done at the room first mentioned as heated by coal and wood stoves. It is mainly on that account that tests of the heat of that room show better results than other rooms warmed by stoves, without special ventilation. The first test of one room with school in session made on two very cold days showed sixty-eight degrees and seventy degrees at five feet, and thirty-three degrees and thirty degrees at the floor.

One test was made in very cold weather of a room heated by a common coal stove, the chimney having an extra flue with a two feet square opening near the floor to exhaust air from the room, no provision being made for admitting a supply of air to the room. The test showed a very low temperature near the floor. The reason is evident. Having a strong exhaust near the floor, the air to supply the exhaust had to come mainly from joints and cracks at the doors, windows and floors. The cold air thus admitted, being heavier than the air in the room, made a cold current near the floor toward the exhaust flue.

Whenever there is an exhaust of air from a room, provision should be made for the direct entrance of air more than sufficient to supply the exhaust, and in a manner to avoid unpleasant draught.

In providing for heat and ventilation the first condition is to be sure to have sufficient heating capacity for the coldest weather. How to distribute heat the most evenly, and keep the air in the room always pure enough are points for consideration.

The coldest air in a room is near the floor, and if, as some authorities claim, the most impure air is also to be found near the floor, it is more desirable in cold weather, both on account of good ventilation and economy in heating, to exhaust the air at openings near to or at the floor.

Rooms heated by the New York, Michigan and Cincinnati ventilating stoves and by common stoves, assisted by an abundant supply of fresh air and exhaust of foul air, although not found to be as evenly heated in very cold weather as the ventilated rooms which are heated by furnaces, yet taking into account the good ventilation secured, and the small expense incurred by these methods of heating, may be properly considered a great improvement upon any rooms heated by direct radiation, where no fresh-air supply and foul-air exhaust are provided.

It is impossible to get evenly heated and well-ventilated rooms, where no means are provided for admitting air except doors and windows. The least objectionable way to admit air at the windows, is to have a strip of wood secured to the window seat or lintel close to the sash, the strip to be one or two inches in thickness the whole width of the window, so that the lower sash may be raised, or the upper sash may be lowered one or two inches, and admit air only at the meeting-rails of the sashes. This gives the air an upward movement as it enters the room, and allows no large volume of air to enter at one place. Where such means are furnished, the teachers do not always see the importance of using them, and it is easier to open one window wide than to open several windows a little. If a stove stands near a window so that it is practicable to open the window, and by a spout or shoot convey fresh air from the window to mix with the hot air rising from the stove, this method may supply enough fresh air, and avoid the cold draughts that would come from ordinary window openings. Some attempt to provide ventilation has been made by casing stoves with sheet-iron to allow of bringing a supply of fresh warm air into the room between the stove and casing, and removing the foul air through chimney flue-openings near the floor. If the supply of air is enough to fill the room every half hour, good ventilation is obtained; but, in using this method of heating, a part of the stove should not be cased, so that in very cold weather direct heat may be used for warming the feet of the children. For the same reason furnace hot-air pipes should enter the room at or near the floor.

INFERENCES.

One thermometer placed anywhere in a school-room is not a sufficient guide for regulating the temperature of the room.

If a school-room has but one thermometer, it should be placed much nearer the floor than is customary, or about the height of the heads of the pupils when sitting.

TABLE I.

Room, 12′ x 28′ x 38′, heated by a furnace, ventilated by two chimney exhaust-flues with openings near the floor and fresh cold-air supply at the ceiling, after the plan of Durant's patent, as applied by A. B. Brown, Architect, Worcester.

Time of Observation.	Degrees.				Degrees.	
	Outside Temperature.	Room Temperatures at			Differences of Temperature at	
		5 feet.	3 feet.	2 inches.	5 feet and 2 inches.	3 feet and 2 inches.
9	33	73	69	62	11	7
10½	34	72	70	68	4	2
3	32	72	70	67	5	3
9	10	61	59	55	6	4
10½	12	65	63	57	8	6
3	16	72	68	66	6	2
9	35	73	70	67	6	3
10½	35	72	68	65	7	3
3	22	72	68	65	7	3
9	6	69	67	65	4	2
10½	9	72	70	68	4	2
3	12	80	75	70	10	5
9	15	58	56	52	6	4
10½	21	69	66	58	11	8
3	29	75	70	69	6	1
9	10	71	69	65	6	4
10½	11	70	68	65	5	3
3	10	80	75	71	9	4
9	8	69	65	60	9	5
10½	15	78	70	65	13	5
3	17	74	70	70	4	0
9	27	71	69	66	5	3
10½	29	78	72	70	8	2
3	33	72	70	69	3	1
9	30	70	68	64	6	4
10½	34	78	72	68	10	4
3	32	72	70	68	4	2
9	23	60	56	50	10	6
10½	25	66	60	56	10	4
3	26	68	62	60	8	2
9	28	66	60	56	10	4
10½	30	70	64	60	10	4
3	35	72	68	66	6	2
9	48	60	58	54	6	4
10½	50	70	64	60	10	4
3	45	72	68	66	6	2
9	6	62	58	52	10	6
10½	7	70	66	60	10	6
3	9	74	70	66	8	4
9	8	68	62	56	12	6
10½	12	68	64	60	8	4
3	20	70	66	60	10	6
9	22	68	66	60	8	6
10½	24	70	66	62	8	4
Average of 44 tests.	22½	70	66	63	7.6	3.8

TABLE III.

Records at other School-Rooms.

Rooms.	Tests.	Degrees.		
		Average Outside Temperature.	Difference in Temperature at 5 ft. and 2 in.	Difference in Temperature at 3 ft. and 2 in.
Heated by furnace, Durant's Ventilation...........	41	22	6½	4
" " " "	39	22	10	5.9
Heated by coal and wood stoves, (fires all night)....	42	22	10.3	8.3
Heated by open ventilating stove, made by N. Y. Open Stove Ventilating Co.....................	36	22	12	8
Heated by Michigan Ventilating Stove, some exhaust from the floor...........................	40	22	13.1	9.1
Heated by coal stove (fire all night) ventilated by exhaust from floor, and supply of fresh air at the ceiling....	40	22	13.6	12.4[1]
Same as room above...................	40	22	13.7	9.3
Heated by Ventilating Stove of John Grossius, Cincinnati, ventilated by air-supply through the stove and also at the ceiling, exhausts at the floor..	40	22	13.9	9.3
Heated by N. Y. Open Ventilating Stove............	33	22	14.2	10.1
Heated by Grossius's Ventilating Stove, exhaust at the floor.....................................	41	22	14.9	7.9
Heated by coal stove, no ventilation................	12	21	12.5	8.1
Heated by coal stove, (continuous fire), no ventilation..	12	17	19	15.6
Heated by wood stove, low ceiling..................	16	24	22	13

The colder the weather the more difference there is in the temperature of a room at different heights from the floor.

[1] This bad result was due to having the openings for supply of air too small compared with the exhaust.

TABLE II.

Room, 9′ x 19′ x 38′, heated by a cast-iron stove with a smoke-pipe nearly the whole length of the room to the chimney.

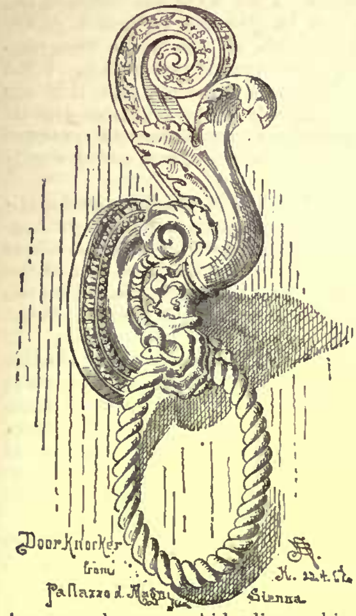
Time of Observation.	Degrees.				Degrees.	
	Outside Temperature.	Room Temperatures at			Differences in Temperature between	
		5 feet.	3 feet.	2 inches.	5 feet and 2 inches.	3 feet and 2 inches.
9	33	68	66	58	10	8
10½	34	72	68	60	12	8
3	32	74	72	66	8	6
9	10	60	56	44	16	12
10½	12	66	64	54	12	10
3	16	80	76	66	14	10
9	35	68	62	58	10	4
10½	35	80	76	62	18	14
3	22	72	70	62	10	8
9						
10½	9	76	72	52	24	20
3	12	78	76	64	14	12
10½	21	74	70	56	18	14
3	29	74	72	62	12	10
10½	11	70	62	52	18	14
3	10	72	70	60	12	10
9						
10½	15	68	66	50	18	16
3	17	68	66	56	12	10
9	27	66	60	42	24	18
10½	29	76	72	52	24	20
3	33	71	68	61	10	7
9	30	70	65	50	20	5
10½	34	79	77	61	18	16
3	32	78	73	66	12	7
9	23	67	61	56	11	5
10½	25	78	72	60	18	2
9	28	62	58	44	18	14
10½	30	74	70	56	18	14
3	35	80	76	66	14	10
9	48	70	66	52	18	14
10½	50	74	70	58	16	12
3	45	80	76	66	14	10
10½	7	68	66	52	16	14
3	9	74	71	62	12	9
9	8	65	63	41	24	22
10½	12	71	70	54	17	16
3	20	74	70	62	12	8
9	22	64	61	42	22	19
10½	24	78	72	58	20	14
Average of 34 tests.	24	72	69	56	15.6	12.1

A room may be considered to be evenly heated when there is less than ten degrees difference in temperature between the floor and a point five feet above the floor, in weather colder than twenty degrees Fahrenheit.

It should be observed that these tests were made in a time of very cold weather; on only one day of the fifteen was the temperature above thirty-two degrees at the three times of observation. The average temperature at all the observations was about twenty-three degrees. Since the first publication in the *Old Colony Memorial* of these tests, people of other towns have said, "Some of your school-rooms in Plymouth are very badly heated." The answer is, the rooms tested that were heated by stoves without special ventilation are samples of rooms found all over New England, and if tests are made of the school-rooms of the most of the towns and cities in time of very cold weather the same alarming results will be found.

Cost of Wall-painting. — It is obviously impossible to fix a tariff for artistic mural painting, but some step in this direction may be made by an examination of the sums paid abroad to distinguished artists for their work. If we divide the price paid to Paul Delaroche for the "Hemicycle" by the number of square yards the work contains, we find the cost to have been about 30*l.* per square yard; and if we make the same calculation in respect to Flandrin's frieze of St. Vincent de Paul, we find that the work was done for less than 22*l.* a square yard. Delaroche's work can hardly be called decorative. It is an elaborately-finished oil-painting; but Flandrin's may be taken as a fair specimen of decorative painting of the very highest class. Where the panel to be painted is small, and where the figures are required to be life-size, the artist would naturally require a higher rate of remuneration; but after taking this into consideration, and after making every allowance for our extravagant age, I think that no mural painting ought to cost more than 50*l.* a square yard, and that a great deal of effective and good work might be done for less than half that price, certainly when the work is at a great distance from the eye. I am speaking of fairly-remunerative prices; of course, it has happened, and will often happen again, that an artist may undertake an important work for the sake of increasing his reputation, or he may be influenced by other motives which may induce him to accept a mere nominal sum; but it is clear that these cases must always be exceptional, and cannot properly enter into our calculation of cost.—*E. Armitage, R. A.*

DE NEUVILLE AND THE FRANCO-PRUSSIAN WAR.



EN CAMPAGNE[1] is a new work published by Messrs. Boussod, the successors of Goupil & Co. It is the history of the Franco-German war, as told by de Neuville's pictures and drawings, which are reproduced in typo-gravure by the Manzi process. The large subjects, such as Gravelotte, Le Bourget, and St. Privat, so effective and vigorous as paintings, lose more by transcription than the smaller ones which are evidently reproduced from drawings. The story opens with the "Départ du Battaillon." The scene is laid in a street of some Alsatian town; on the right is an old house with high-pitched roof and over-hanging eaves. The battalion is disappearing in the distance, and passing the church, where one faintly sees the priest blessing the soldiers as they march by. The captain turns round to hurry on two men who are leaving the house — the one to bid adieu to his sweetheart, the other to quaff off the last mug of ale tendered him by his kind host. De Neuville seems to have been specially fond of the *Chasseurs à pied*, or Rifles, with their sombre green and blue uniform. A capital drawing is the trumpeter of this corps standing erect against a wintry background. Perhaps one of the most successful parts of this painter's work is his treatment of the backgrounds. They are more or less vague, and detract nothing from the principal figure; at the same time the trees and shrubs, the buildings, or the horses and men, are all equally well drawn. De Neuville perfectly understood the law of sacrifice in art, and in these days of false impressions it is well to bear this in mind. He was a thoroughly realistic painter and a thorough impressionist, in the sense that Valasquez and Goya were realists and impressionists. But he was also an idealist; he saw the poetry of even such horrible scenes as St. Privat and Le Bourget, and it is this combination of faculties which makes all his pictures, even those which are full of the most hideous carnage, pathetic and poetic.

There is immense movement in the "Défense de la porte de Longboyau" — a handful of men struggling to prevent the influx of Germans from the other side of the gate, while a field-piece is being hurried away out of danger.

What we admire most in this publication are the single figures — a dragoon officer, an artillery officer suddenly pulling up his horse with a cry of "Halte!" and two admirable drawings of a Zouave and a Turco. Here are all the characteristics of the men of these regiments — the dare-devil swagger of the Zouave, and the semi-civilized scowl of the swarthy Arab. But what loads these men carry on their backs! Knapsacks, portions of tents, pots and pans, provisions, and arms; and yet they smoke their cigars with as much complacency as if they were loafing about the Tuileries gardens. Visitors to Paris before the war may remember these men in their blue and yellow uniform, guarding the precincts of the palace, and the color only is wanting to reproduce the man in all his semi-barbarous picturesqueness.

Some of the pictures, as the "Passage d'un Gué," are the last we shall see of the old uniforms. Hussars and Lancers are now comprehended in light cavalry with little variation of uniform; and the only difference between the various corps of heavy cavalry are small details, and in some regiments, as for example the Cuirassiers, the wearing of armor. Since 1871 France has spent her war budget upon more useful things than handsome uniforms.

The "Concert aux avant postes" is a quaint episode of some Parisian soldiers who have brought a piano and some comfortable furniture from a house hard by. The scene might be the outskirts of Neuilly or Billancourt. A man is enthusiastically playing (perhaps he is a pupil of the Conservatoire), while an officer smokes away upon the sofa. Around are soldiers in various moods of boredom, sleepiness and shiveringness. Behind is the wall on which lie some sand bags. One wonders if this was the cause of so many of the "surprises" which took place and which ended in defeat and cries of "*Nous sommes trahis!*" It is related by M. Richard that when their picture was exhibited at the Salon, a Parisian workman remarked to his companion befringed *à la chien*, "*Tiens, regarde Titine, comme c'est bien Parisien.*" Whereupon an officer in uniform at their side remarked "*Mais ce qui aurait été tout à fait Prussien, c'est que ces gaillards là, surpris, enlevés, empoignés eussent été expédiés le soir même sur Spandau ou sur Stettin.*" De Neuville understood the Parisian character, and although he paints their serious side in such works as "Le Bourget," he was quite ready to see the frivolous side when it suited his humor.

An accessory that adds so much to the picturesqueness of these works is the wintery backgrounds. Who can regard the "Mot d'ordre" without being touched by the sufferings of men who had two or three hours of sentinel-work with the thermometer marking seven degrees or eight degrees Fahrenheit? Looking at the "Prisonniers Allemands dans une église" one wonders that a single guard was sufficient for some twelve or fourteen prisoners. Here one begins to see some of the horrors of war; the peaceful abode where man's spiritual nature finds rest and comfort is desecrated and turned into a prison-house. The lamp has ceased to burn, the seats are all over-turned, and the rude soldiers are lying all over the floor. Naturally, de Neuville was a partisan; but no one can affirm that he has exaggerated to any great extent the clumsiness, not to say boorishness of the German soldiers. We do not mean to say that the German is more brutal than the Frenchman — when the demon within us is roused there is little difference between the nations; but there is no doubt that the type of the Frenchman, his long thin face and well-chiselled features, is far more refined than the typical Bavarian with broad face, high cheek-bones, and rudely-cut features. Yet de Neuville does justice to the German at times, as in his "Cuirassier Allemand," a noble figure in the handsome white uniform leaning on his horse, which turns his beautiful head round to his master. "St. Privat" is as a picture the most touching of de Neuville's works, but the engraving does not give a fair representation of it. Is is confused, and no one looking at it would have any idea of the effect the picture had upon the public when it was exhibited at the Salon. Hour after hour the crowd streamed by and only few left it with dry eyes. Here was played-out the last act of the day's tragedy. A handful of men barricaded themselves in the cemetery and kept it until overwhelmed and outnumbered by the never-ceasing Germans who poured in. It was a bitter day for the enemy — the flower of the German army was engaged and re-enforcements were constantly required, and yet so dearly was success purchased that the king telegraphed to the queen "My guards have found their tomb before St. Privat." The picture represents the last effort of the French — everywhere are men strewn about dying, or dead. But the pathetic touch is given by the four or five wounded men standing up in the corner of the church-yard awaiting the end with stolid resignation. "Les dernières cartouches" engraves better. It is dramatic to the last degree. A Turco and a Chasseur are firing their last cartridges from a window, a wounded officer peering over them. At the open door of the room a soldier staggers in, while by the side of the bed on which a wounded man lies stands a marine. This man's expression is a study in itself. Determination, anger, the ferocity of the bull-dog are all there; woe betide the enemy when next this man gets a chance of fighting; already he is brooding over the "*revenche*." "Les otages" was never exhibited at the Salon. Painted soon after the peace, it was thought possible the German government might object. And perhaps not without reason, for here is another phase of war. A convoy of prisoners consisting of M. le Maire, M. le Curé, and an aged farmer followed by two Uhlans, was not likely to reflect over well upon the generosity of the enemy. So too the "Capture difficile" contains a *double entendre* at the expense of the Germans. Doubtless the immediate shooting of Franc-tireurs, and peasants found with despatches, may be politic, and on that ground defensible; but to the ordinary civilian's mind it seems brutal and unwarrantable to treat them as spies.

The "Destruction d'un télégraphe" was the last work attempted by de Neuville. Only the sketch and some studies were completed when the death came and put an end to his art, his patriotism, and his sufferings.

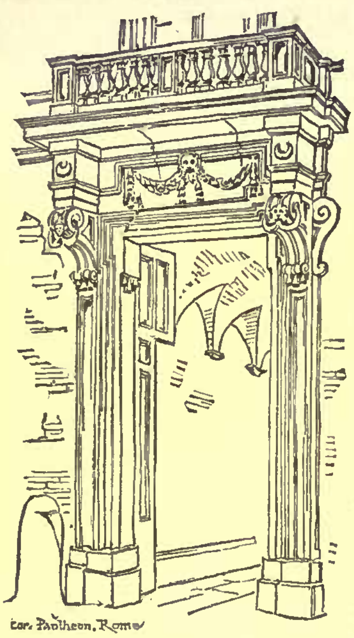
The book concludes with "Le Bourget," that desperate effort of the garrison of Paris, consisting of mobiles, volunteers, and a few regulars who had escaped from the defeated armies. Eight officers and about twenty men refused to be beaten; they retired into the church and held it for some time — indeed it required a cannon to be brought up ere they would capitulate. When the doors were forced open nearly all the garrison were wounded or dead. It was grand and heroic, but utterly useless. Like poor Regnault, many men were carried away by enthusiasm and emotion and sacrificed their lives, bravely, no doubt, but foolishly. Bravado is not bravery, and self-sacrifice can be practised by obeying disagreeable orders, as well as by uselessly disputing a lost cause. De Neuville served himself during the siege, and had many opportunities of filling his note-book. Why should not these be published in fac-simile? Such a thing is never done, but an artist's sketch-book contains generally the most interesting of his work.

We commend this publication to our readers, both for its excellence and its cheapness. Reproductions of the works of the greatest military painter of the age for eleven francs are things to be possessed by all who have any real love or knowledge of art.

[1] "*En Campagne.*" Tableaux et Dessins de A. de Neuville, Texte de Jules Richard. Boussod, Valadon et Cie., 9 rue Chapral, Paris. 4 parts, 2 fs. each, or 11 fs. bound.

UNCOVERING THE BASE OF THE SPHINX. — Since the 7th of January last, several hundred Egyptian fellaheen have been at work under the direction of Brugsch Bey (formerly commissioner to the Centennial Exhibition) removing the sand which has hitherto enshrouded the great Sphinx up to its very neck. By the end of this month the whole of it, amounting to over 20,000 cubic metres, will have been removed, and the grand old monument, raised by the Pharaohs over 4,000 years ago, will be again visible in all its beauty. A high wall is being built around it, to prevent the desert-sands from again submerging it. — *New York Mail and Express.*

THE DISINTEGRATION OF THE EGYPTIAN OBELISK IN THE CENTRAL PARK, NEW YORK.



Italian Doorway from sketch by the late Sir Digby Wyatt. Lond:

THE decay of the stone of the Obelisk in the Central Park of New York has attracted a great deal of attention, on account of the publicity which has been given to its having been coated with paraffine in order to preserve it. I have therefore thought it would be of interest to this Society to know of the results of a special examination which I have made of it, in addition to those already communicated.[1] It was supposed when the Obelisk was brought here that it was in a perfect condition, and that it had not suffered at all by its exposure to the climate of Egypt for three thousand five hundred years. A careful examination of the Obelisk itself, and of the pieces which have been detached from it, shows, however, that this was not the case, but that disintegration has been going on for a very long time in the interior of the stone, which has only become apparent within a few months, owing to the fact that, until its erection in the Central Park, there were no causes which tended to attract attention to the weakness of the stone. For some months it has been noticed that pieces of the Obelisk have been falling about the base. These pieces, mostly of small size, attracted the attention of those interested in its preservation, and led Mr. A. Hague, during the last summer, to make an investigation of the condition of the whole shaft while the scaffolding used by the workmen in putting on the paraffine coating was still up and they were chipping off the cracked pieces and heating the surface of the Obelisk preparatory to putting on the paraffine. This examination showed that the south and west faces, which were exposed to the direct rays of the sun, were the most weathered, but that it was cracked on all sides, showing that a process of decay had begun which is likely to lead to most serious consequences if the Obelisk is not protected.

The process of decay through which the stone is passing is not of the chemical nature which has been attributed to it. This is shown not only by an inspection of the Obelisk itself, but by the microscopic examination of the pieces of the stone detached from it. The first thing done by the workmen in getting the stone ready for the coating which was to protect it, was to pick off all the pieces which were already so much cracked as to be easily separated, with small iron tools. In doing this, pieces of an inch square up to those which were over a foot long and nearly two inches in thickness were detached. These pieces appear to the unaided eye to be of perfectly natural stone. Many of them are coated with a green substance which I at first supposed to be a mineral, and which, from its peculiar color, I took to be epidote. A careful microscopic examination, however, did not show any crystals or fibres, which made me withdraw the determination and decide that it must be some kind of vegetable stain. Mr. P. H. Dudley, who has made a careful microscopic examination of this stain, pronounces it to be a very low order of vegetable growth belonging to the genus *Protococcus*, probably the species *pluvialis*, a variety not found in this country, and known mostly in Egypt. What strikes one at first, in making an examination of the pieces of stone, is their remarkably fresh appearance, except where they are colored green. The crystals of feldspar are large and rosy, and do not, to the eye, show any sign or trace of decomposition. Where the fracture of the stone is quite fresh it looks like any other syenitic granite, with a considerable preponderance of hornblende, and but a small quantity of mica. To the naked eye, only quartz, feldspar, hornblende and mica are visible. Under the microscope, tourmaline, zircon, titanite and magnetite are seen in small quantities with perfectly fresh fractures, and not showing the least sign of decomposition. With a one-and-one-half-inch objective and powerful light, I first began to notice small cavities here and there, of irregular shape, and quite deep, sometimes entirely empty, but often containing a substance having very much the appearance of the hornblende and pyroxene in specimens which occur in limestone, and have been placed in acid to detach the crystals. These cavities, though not numerous, occur only in the vicinity of the hornblende. On searching for them I found them relatively numerous when all the surfaces of attack were taken into consideration, and sometimes so deep that their bottom could not be seen with an inch objective. Pittings, easily distinguishable after a little study, giving the quartz and the feldspar the appearance of having been etched very slightly with hydrofluoric acid, were quite visible. They were not uniform, but were sufficiently numerous in places to give the surface a greasy appearance. In some places the crystals of hornblende were completely gone, leaving the shape of their crystals in the rock. I did not notice any decay in any of the other minerals, and this one seemed to be most prominent in the vicinity of the vegetable growth, but I was unable to determine whether this appearance of a part of the quartz and feldspar, having gone into solution, was owing wholly or in part to it.

The quantity of the pieces removed from the Obelisk previous to putting on the paraffine is reported to have been as much as eight hundred pounds, and was probably considerably more than that. These pieces have been freely circulated, and can frequently be seen in the possession of curiosity hunters in different parts of the United States, some of them having a few pieces and others several pounds. What the future of the monument is to be is a matter of some anxiety. It is certain now that the opinion advanced at the time that the Obelisk was erected in Central Park, that the stone was quite sound when it was erected there was a mistake. It was full of minute cracks when it came here. This is shown by the rapid disintegration of the stone, which has suffered more in the five years of exposure in the Central Park than in the 3,500 of its previous history, and also by the fact that the cracks are filled with vegetable life which received sufficient light through the stone to be colored yellow and green by the chlorophyl, the depth of the stone being shown by the variation of tinge of green. In moist places this kind of vegetable growth does not take long to propagate itself, but in dry ones, like the interior of the cracks in granite, it must have taken many years. To have affected the stone even slightly, as it appears to have done, must have taken many more. It is quite possible that the germs of the vegetable matter were in the stone when it was in Egypt, and did not develop there because they did not have sufficient moisture to cause them to germinate, and that they only commenced to grow when brought here. It is also quite possible that this vegetable growth is not the cause of any of the apparent solution or pitting, though the appearances are exactly like those of other minerals whose surfaces have been slightly acted on; but it is certain that, while the chemical action on the stone is very slight, there has been a deep-seated and prolonged disintegration of the rock from purely physical causes, producing cracks and ruptures along the lines of greatest weaknesses, and that the stone has no longer the strength to resist the atmospheric influences of our very changeable climate, where the extremes of heat and cold are so very great, and where, as compared to Egypt, the amount of moisture in the air is always at a maximum.

The method of applying the present protecting coating seems to have been a fatal mistake. Nothing of any account has been dissolved out of the stone, there is, therefore, nothing to be replaced. If there has been, paraffine in solution would have been one of the best materials to fill them. Granite is not porous, there were, therefore, no cavities to be filled. The stone being full of cracks from natural causes, the heat which was used to cause the paraffine to sink into the body of the stone, when applied to the outside would cause an expansion, which would not be responded to by the interior of the granite, and the cracks already there would increase in size, and pieces would chip off as they did, and new cracks would be formed in the stone already weakened by long exposure. This is distinctly traceable on almost every specimen chipped off, the old part of the crack showing the stone somewhat less fresh on the surface, while the part recently cracked is quite fresh.

It is expected, now that the Obelisk is supposed to have been water-proofed, that the disintegration will cease, but this appears to me to be founded on an altogether mistaken theory, which is, that the cracking is alone due to the expansion of the ice formed in the cracks. The rapid and extreme changes of temperature in this climate in a stone, which, from its mass alone must have but a feeble conducting power, would be sufficient to cause the disintegration already begun, in a stone weakened by exposure to great heat in a dry climate, to continue with comparative rapidity without the intervention of ice, but simply from the continued expansion and contraction going on on its weakened surface. But in a moist climate like our own, where it was subjected to both extremes of heat and cold, it would take place rapidly, as it has done.

As it was a matter of interest to ascertain how far moisture had to do with the cracking under heat, I made the experiment of submitting pieces of granite which had become quite dry from having been kept housed many years, to as high a heat as could be obtained in the laboratory without melting, and, to my surprise, found that no spalling, or even cracking, occurred, although the pieces were subjected to the heat suddenly and for varying periods of time. It is well-known that granite in buildings, when subjected to fire, spalls. This is owing to the moisture it contains; to the expansion of gas and liquids contained in microscopic bubbles in the quartz; and to the want of conductivity of the stone itself. Perfectly dry granite does not spall unless exposed very suddenly to a very high temperature. No granite, however, exposed to the weather in this climate is ever dry. Fresh granite contains about one per cent of moisture. That weakened by age, like the surface of all the obelisks, may contain many times that amount, consequently all granites on the outside of structures do spall when exposed to fire. From the fact that the stone of the Central Park Obelisk is already weakened and probably full of fissures, which in this climate will tend to develop year by

[1] A paper on the Decay and Preservation of Building Stone, read by T. Egleston, Ph. D., at Annual Convention Am. Soc. Civil Engineers, June, 1885. From the *Transactions* of the Am. Soc. C. E.

year, and from the very fact that the disintegrated stone will absorb more moisture than stone which is fresh, it seems probable that no protection or coating given to the stone will arrest the process of disintegration already commenced in it, if it is left exposed. Even if the surface was entirely waterproofed, the cold of winter and the heat of summer would act below the surface both of the coating and of the stone, causing the coating to break or fissures through it to occur, so as to let in the moisture, and then both causes would operate together as before. But in any case heat and cold will act altogether independently of moisture, whether the outside be coated or not, and further disintegration must take place under the same circumstances and conditions as that which has already so much weakened the stone. Placing the Obelisk in the Central Park, where it is exposed to nearly every agency that could tend to destroy it; allowing the surface of a stone already so much weakened by disintegration to be heated, thus causing further cracks to be made in it is a greater monument to public indifference and ignorance than the shaft ever was to the dignitary who first erected it, or the events chronicled in its hieroglyphics.

The same dangers, if the reports about it are true, threaten the Obelisk on the Thames Embankment, although not to the same extent. The climate of England is much less severe than ours, both in winter and in summer. The causes for disintegration being the same in both cases, will affect the London Obelisk less than ours, and there seems to be, so far as any examination of it has been made, no great present danger in leaving it exposed where it is. The Obelisk in the Place de la Concorde, in Paris, is reported cracked all over its surface. Both the European Obelisks are therefore in danger of being seriously damaged within the next hundred years. Housing seems to be the only thing left for the Obelisk in Central Park.

CORRUPTION AGAIN.

When men ask one to "burn this letter," or impress on one's attention that the offer they are making is "strictly confidential," it is perfectly fair to assume that they know they are engaged in a discreditable manœuvre, and it may be comforting to them to know that there are a great many people whose opinion of their action will agree very exactly with their own. We trust that the epidemic which seems to have broken out amongst business men whose moral senses have never been properly cultivated will not be of long duration, as we can make much better use of our scanty space than by filling it with such indecencies as the following: —

NOTICE.

Dear Sir,— We will be pleased to give you fifteen per cent commission on any orders you may favor us with, or any work we get through your influence in granite or marble monuments, tablets, fences, or any description of cemetery improvements in our line. We own our own quarries and have superior facilities to do work at moderate cost. *If you do not wish to have your name used in the transaction*, please write by postal card the particulars; where the parties can be seen, the cemetery they bury in, size of their plot, or number of the grave or graves.

For fair and honorable dealing we can refer you to some of the principal undertakers in New York, Brooklyn and Jersey City.

This is *strictly confidential* and reliable, and you can rest assured any orders filled through you, let the amount be large or small, we will pay you your commission in full, and feel very thankful for the favor.

Very truly yours, Garity Brothers,
229 Broadway, New York City, Room 50.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

ERRATA.

Boston, April 10, 1886.

To the Editors of the American Architect: —

Dear Sirs,— There is a slight omission in your printed copy of my letter. The second paragraph should have been as follows: —

"In the case of a factory costing, for instance, five hundred thousand dollars, filled and stocked ready to start, the proportionate expenditure *on the building* would be one hundred and fifty thousand dollars *and three hundred and fifty thousand dollars* for the contents, consisting of machinery and stock."

The words in italic are what were omitted. Yours truly,

Edward Atkinson.

Boston, April 10, 1886.

To the Editors of the American Architect: —

Dear Sirs,— I see a blood-curdling mistake in to-day's issue.

The illustration is not the Erythræan Sibyl by Michael Angelo, but *Au.ustus and the Sibyl*, by Baldassare Peruzzi (1481–1536). Fresco, Church of Fonte Giusta, Siena.

Your rather concise question the other day referred, I thought, to the Sistine Chapel Sibyl, by Michael Angelo.

Please correct in note of next issue, for this error mortifies me.

Yours, Frederic Crowninshield.

DESIGNS FOR INCANDESCENT ELECTRIC-LAMPS.

Pittsburgh, Pa., April 7, 1886.

To the Editors of the American Architect: —

Dear Sirs,— Referring to the many excellent illustrations in your magazine of details of ornament in the way of architectural matters, etc., is it in your province to, at some time, give some suggestions in that way of illustrations for fixtures and methods of using incandescent electric-lamps that are original, and peculiar to the capabilities of incandescent electric-lighting? Everything, so far as I have seen, is a modification or readjustment of old gas-fixtures, and it seems to me that all that can be departed from without very much effort, and new methods of lighting can be devised that will be artistic and moderate in expense.

We have lately put in our club-house an incandescent electric-lighting plant, and as we remodel our house and make changes I want to introduce methods of lighting different from anything I have heretofore seen. Yours respectfully, G. T. C.

BOOKS.

Belton, Texas.

To the Editors of the American Architect: —

Dear Sirs, — Will you be kind enough to give me the names of what you consider the best works on architecture, of whom they can be had, and at what prices? Very respectfully, J. C. Letts.

[We refer you to the list recommended by the Royal Institute of British Architects, and published in the *American Architect* for November 28, 1885.— Eds. American Architect.]

New York City, April 6, 1886.

To the Editors of the American Architect: —

Dear Sirs,— Would you kindly inform me through your valuable paper if there are any books in either English, French, or German, that treat of bakeries, and oblige, Respectfully yours,

Subscriber.

[We suppose there may be such works, but cannot find any trace of them. — Eds. American Architect.]

NOTES AND CLIPPINGS

Hydraulic Salt-Mining. — *Erratum* — In the analyses of salt and brine from the hydraulic salt mines at Marine City, Mich., described in the *American Architect*, April 10th, Page 180, for chloride of calcium, read *chloride of sodium*.

The Cut Nail Business — Output for 1885. — The American Iron and Steel Association, of Philadelphia, has received from the manufacturers complete reports of the production of cut-nails and cut-spikes in 1885. The total production in the year named was 6,696,815 kegs of 100 pounds each, against 7,581,379 kegs in 1884, and 7,762,737 kegs in 1883. The production of 1883 was the largest ever attained. As compared with 1884, there was a falling-off in 1885 of 884,564 kegs, or over 11 per cent, while, as compared with 1883, there was a falling-off in 1885 of 1,065,922 kegs, or almost 14 per cent. The decreased production in 1885 is very largely due to the stoppage of many Western nail-factories for the last seven months of the year, in consequence of a disagreement over nailers' wages, the manufacturers insisting upon a reduction, which the nailers were not willing to accept.

The Sphinx. — An appeal has been made by M. Ernest Renan for funds to enable M. Maspero to remove the sand from around the Great Sphinx. The work, he says, is valuable, and will enable us to descend into a world that is more than 6,000 years old, and will push farther back the limits of a past age that seems to become more remote as we try to reach it.

"The clearing of the Great Sphinx," says M. Renan, "was begun two months ago. Up to the present time the ordinary resources of the Boulak Museum have sufficed for the work, which might be completed in sixty days if money did not fail. About 20,000 francs only are wanted. The appeal for the Longson excavations, which was addressed two years ago to the intellectual public, was so fruitful that we are encouraged once more to ask the true connoisseurs in ancient things to contribute to one of the works, the most imperiously demanded by the present condition of Egyptology. The Great Sphinx of Ghizeh, at two steps from the Pyramids, is, in my opinion, the most astonishing work of the hand of man which past ages have bequeathed to us. It is an immense bed of carved rock, about 70 mètres in length. The height of the monstrous edifice, if it were cleared, would exceed that of the highest houses. No fashioned monument, either in the rest of Egypt or in the rest of the world, can be compared to this strange idol, the vestige of a stage of humanity which baffles all our ideas. The impression which such a spectacle must have produced on imaginative races, and who were dominated by the senses, may be understood from that experienced by the Egyptians of the present day when standing before that enormous head emerging from the sand and casting across the desert its sad look. The Arab at this sight flies terrified, either throwing a stone or firing a gun at the strange being. The temple opposite the Sphinx, if it is a temple, has also a character of its own. This fantastic construction resembles less the other temples of Egypt than the Pantheon resembles Notre Dame. But that all this ensemble, which is unique in the world, must be of the remotest antiquity is indisputable, since the statues found there are those of King Chepren, thus taking us back to ages which everywhere but in Egypt would be called fabulous."

The Efficacy of Rag Disinfection — Mr. S. D. Warren, Jr., of Boston, being somewhat sceptical in regard to the efficiency of the steam-screw process of disinfection, had manufactured a dozen accurate maximum-temperature thermometers and sent them abroad, where they were cunningly hidden in a bale of rags and reshipped to the United States. After that bale of rags had been "disinfected" by the steam-screw process, not one of the thermometers showed a registered temperature of 212°, and most of them indicated a heat of 120°, or thereabout, a degree of heat in which disease germs do most delight. — *Evening Post.*

Waterproofing for Walls. — Herren Bleininger and Hasselmann, two German chemists, have described a method of making facing materials for inner walls likely to become damp. After drying and grinding the clay, they make a mixture of clay, 91 1-2 parts; iron filings, 3 parts; common salt, 2 parts; potash, 1 1-2 parts; elder or willow woodashes, 2 parts. The whole is heated to a temperature varying from 1,850 to 2,000° centigrade — 3,362 to 3,632° Fahrenheit. At the end of from four to five hours the argillaceous mixture is run into moulds, then rebaked in the ovens — always protected from the air — at a temperature of 842 to 932° Fahrenheit. The product may be variously colored, by adding to the above 100 parts: 2 parts of manganese for a violet brown, 1 part of manganese for violet, 1 part of copper ashes for green, 1 part arseniate of cobalt for blue, 2 parts of antimony for yellow, and 1 1-2 parts of arsenic and 1 part oxide of tin for white. The *Scientific American* says these products resist the action of acids, and are well adapted for sewers, etc.

New York Bricks. — The forty-five brick-yards at Haverstraw, N. Y., on the Hudson River, 32 miles above New York city, the largest brick-making centre in the country, with a capacity for making 340,000,000 bricks annually, turned out 300,000,000 in 1885, against a like number in 1884. About 2,000 men are employed besides 300 in the river-carrying trade, which keeps 44 barges and 50 small vessels busy. Haverstraw bricks are of ordinary grade, but bring 25 to 50 cents per 1,000 more than other bricks of like quality, owing to the excellent sand and clay used. They brought an average of $6 per 1,000 in New York last season after paying $1 river freight and $1 to a $1.25 per 1,000 royality to the owners of the land where the yards are located. The works use in a season 42,000 cords of wood at $5 per cord for heating kilns; 12,000 tons of coal-dust at $2 per ton; and 4,000 tons of coal at $4.25 per ton; a total cost for fuel of $251,000. The total royalities were, as above, say $337,000, and wages (averaging $2.25 per day), say (six months), about $776,000. Two hundred patent brick-pressing machines, costing $1,000 each are employed. The total gross receipts last year are given at $1,800,000. This particular industry began fifty years ago. At that time $3 per 1,000 was a fair price. Quotations have been as high as $9. *Scientific American.*

New By-Laws for Concrete Building in London. — The following is the draft of the new by-laws proposed to be adopted (under the provisions of the Metropolis Management and Building Acts Amendment Act, 1878) with regard to concrete-building. The Board announces its intention of asking the Home Secretary to confirm them: —

Metropolis Management and Building Acts Amendment Act, 1878, Sec. 16. Addenda to By-laws.

2a. *Description and Quality of the Substance of Walls.*

Whenever concrete is used in the construction of walls, the concrete shall be composed of Portland cement, and of clean Thames or pit ballast, or gravel, or broken brick or stone, or furnace clinkers, with clean sand, in the following proportions, viz.: One part of Portland cement, two parts of clean sand, and three parts of coarse material, which is to be broken up sufficiently small to pass through a two-inch ring.

The proportions of the materials to be strictly observed, and to be ascertained by careful admeasurement; and the mixing, either by machine or hand, to be most carefully done with clean water, and, if mixed by hand, the material to be turned over dry before the water is added.

The walls to be carried up regularly and in parallel frames of equal height, and the surface of the concrete filled in; the frame to be left rough and uneven to form a key for the next frame of concrete.

The thicknesses of concrete walls to be equal at the least to the thicknesses for walls to be constructed of brickwork, prescribed by the 12th section in the first schedule of the Metropolitan Building Act, 1855.

Such portions of concrete party-walls and chimney-stacks as are carried above the roofs of buildings to be rendered externally with Portland cement.

The Architect of the Celestial Kingdom. — The Mormons have just had another revelation from heaven, which indicates that their Prophet, the late Mr. Joseph Smith, is much more innocently employed there than he was on earth. They are building a big tabernacle at Provo, the second city in importance in Utah Territory, and the architect, a Mr. Folsom, was much perplexed about the entrances and exits, when (so he says) the Prophet Joseph appeared to him in a vision and straightened out the crookedness, remarking that architecture is his particular employment in the celestial kingdom. The Salt Lake *Herald*, a journal run by Mr. Caine, the Mormon delegate in Congress, observes:

As the arrangement is altogether novel, and a great improvement over similar edifices throughout the Territory, there is no reason for discrediting Mr. Folsom's somewhat startling assertion.

We recommend this seemingly well-attested vision to the consideration of the American Institute of Architects. We have heard that when the elevators were put into the Equitable Life Assurance Society's building on Broadway, the contractor successfully consulted his deceased father or uncle, through a medium in Ohio, for the plan of them. If the Institute can make a permanent arrangement with the late Mr. Smith for professional services in difficult cases, it will be a great thing for American architecture. It is a pity that some way to communicate with him was not contrived during the building of our local monstrosity, the New York Post Office. But it may not be too late even now to call him in for consultation about the Albany Capitol. — *New York Herald.*

TRADE SURVEYS

Each succeeding week furnishes confirmatory evidence of the unprecedented activity in building. The demand for house room and for manufacturing capacity is still far enough in excess of the supply to afford every needed encouragement to investors and builders to follow out the course they mapped out for themselves a year or two ago. Restricted opportunities for speculation in railway securities has something to do with the phenomenal activity in building of this year and last. The larger and smaller capitalists who for years past have been contributing to the building up of the immense fortunes of the railway-kings, through futile efforts of speculation have of late been finding more satisfaction and profit in putting their money into legitimate enterprise where these investments can be seen and handled. Causes are now at work which will still further stimulate building. So great is the encouragement that, in some quarters, speculation in real estate has cropped out. In several of the larger cities a great deal of real estate has changed hands. In the suburbs of New York, Philadelphia, Chicago, and in some other cities in the Middle and Western States, land suitable for building purposes has advanced thirty-three per cent since last year, and extensive sales have been made on such figures. More or less land is passing into speculative holding. This is to be regretted, as it is liable to obstruct rather than assist enterprise. Investments are paying remarkably well. Small houses in manufacturing centres in the larger cities are paying from ten to eighteen per cent. In smaller towns, less interest is secured, but in all of them the rewards are sufficiently enticing to stimulate building-lot buying. The outlook, with all the discouraging influences, is inviting. Thus far no mistake has been made. Any reputable investor or builder can be readily accommodated with money to build houses, and at a very reasonable rate of interest. The disappearance of tenement-houses, or their equivalents in our larger cities, is being followed by the erection of thousands of small houses costing from $1,500 to $3,500. Many builders are engaged this year in the erection of a better class of houses because of the demand for them which was developed last year. There is also a demand for smaller houses in a great many small towns throughout New York, Pennsylvania, and the West, as well as in New England. The Building and Loan Association plan is not adapted to the requirements of all places. Ready money is wanted to put up houses for immediate occupancy, and not a few lenders and builders are finding employment for capital and labor in supplying these newly arising wants. In several small towns in Pennsylvania and Ohio, the erection of houses costing from one to two thousand dollars has been begun, under the management of companies who see opportunities for profitable investment. The laboring population of these places will be quick to rent or purchase. There is not the least doubt but that a great deal of money will find employment all over the country in its smaller towns and villages. For these and other reasons it can be said that building activity will continue and will expand and will engage much more capital than it has yet. In fact, as has been heretofore intimated, the housing of the people in comfortable and properly-built houses from a sanitary standpoint, as well as from an architectural standpoint, will engage the attention of those who have money to invest and skill and labor to be employed. The freight war between the transcontinental lines has developed a new traffic between the central region of the United States and the Pacific Coast. High transcontinental freight rates have gone forever. New transcontinental roads will fasten this possibility tightly. The outcome of this war, which was at first sorely regretted by railroad managers, will result in the building-up of new industries and in the expansion of valuable commercial relations between the great cities of the interior and of the coast from Portland to Los Angeles. An immense quantity of lumber is being thrown into Atlantic and Western markets. Since April first a slight depression has fallen on the lumber trade. A heavy spring distribution of lumber is in progress at all lumber points. The outlook as to the course of prices is a little uncertain according to lumber authorities, but the reasonable conclusions to be drawn from existing facts are that the production of lumber will be fully equal to the demand. If there is any exception to be mentioned, it is in the case of hard woods, such as cherry, oak, walnut and mahogany. These are scarce and are held very firmly. Railroad construction is being pushed forward with increasing vigor. Within the past week fifteen projections have been made, calling for the construction of about 2,000 miles of road. But little difficulty is experienced in floating bonds for enterprises which are supported by the people of the country through which the projected roads are to pass. The confidence with which a great many of these new enterprises are taken hold of, particularly in the far West, reminds the observer of the confidence with which railroad-building enterprises were supported thirty years ago and more. In the iron trade business is at a stand-still. No large orders have been placed. Buyers are waiting. Locomotive makers are in negotiation for a large amount of work, but railway managers are proceeding cautiously. The anthracite coal combination reports an active demand for that fuel, and prices are firm, partly because of the continuance of the bituminous coal strike. The textile manufacturers of the New England and Middle States are winding up an unusually active winter's and spring's work, and are preparing for what promises to be an autumn demand of large volume. The manufacturers of machinery, tools, implements, and of engines and boilers of large and of small capacity, are enjoying at this time an activity to which they have been strangers for more than two years. The labor question is occupying less of public attention and a harmony is showing itself in some places, but too much like that which was established in Warsaw. The transition from the ten-hour to the nine-hour day will be made without serious discomfiture to employing interests, although in the opinion of some this is disposing of a most serious matter, very indifferently. The equalizing influences are already set at work, and in twelve months, and even less, employing interests at large will find themselves in comfortable relations with labor. During the past week a large number of manufacturing corporations have been established with capital ranging from $10,000 to $150,000 for all manner of work. The New England States, while perhaps not developing as much activity as some other sections, are certainly holding their own. There industries are well employed and the foundations of trade have been broadened and deepened. In New York and Pennsylvania enterprise has been exhibited in iron and steel enterprises, in lumber companies, in the laying of pipe-lines, and in projects for a general expansion of manufacturing capacity. Money is sufficiently abundant, and at moderate rates of interest, to assist the pioneers in new industries. A great deal of new land is being taken up in the West, and immigration is attracted thither by the remunerative markets secured for agricultural products.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 539.

APRIL 24, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

THE Boston Fire Underwriters' Union has been taken with the excellent idea of sending to the various architects in the city a set of circulars containing the various regulations which it has seen fit to adopt in regard to the rating of buildings of different types of construction. The circulars bear the marks of having been hastily prepared, and are sent out on loose sheets of different sizes, so that it will be much less convenient to preserve and use them than if they formed a pamphlet, but it is well that a beginning should be made, and we hope that it will not be long before every architect and owner will be found consulting the insurance rate-book as a preliminary to building operations quite as important as a reference to the statute regulations. As we have often remarked, the influence which underwriters could, if they chose, exercise over the arts of construction in cities is practically unlimited. Against the vigilance of the State inspectors there are only too many ways of providing, and the penalties of the law are, at best, only incurred by flagrant violations of prudent construction, while the underwriters' tariff is, or ought to be, always present with the gentle but irresistible persuasion which attaches, in the business mind, to the offer of five per cent discount in rates here, and ten per cent there, for the adoption of improvements on the cost of which a saving of one-tenth or one-twentieth of the insurance premiums represents a large interest. Fortunately for the community, it seems to be getting unfashionable among insurance managers to affect to despise details of construction, and to exult over large fires as being "good for the trade." Perhaps some of the stockholders who help to pay the losses, without the consolation of drawing the salaries, have been reflecting upon their side of the question; and if their example should be followed by others, we may expect to see in New York and Boston, perhaps in advance of the rest of the world, a most needed change in the attitude of the insurance companies, which are charged in England and France, even more vehemently than here, with having directly encouraged that degradation of the art of building which is now costing the world such enormous sums every year.

THE Boston rules, well intended as they are, seem to us open to so much criticism that we hope we shall be considered only as wishing to help along the good work if we make a few remarks about them. The circular relating to Mills, Factories, Stores, Warehouses, and other buildings used for similar purposes, for instance, begins by saying that the walls must not "exceed sixty feet from the sidewalk." No exception is made to this singular limitation, which would exclude from the insurer's grace nearly all stores more than four stories high, without regard to provisions in the way of sprinklers which might make eight stories just as safe as four. The third and fifth clauses, again, require all floors and roofs to be "made of heavy timbers and planking, without plastering or sheathing." Why sheathing on the underside of the planking, which would be the only practicable plan with the girder construction, should be objected to we cannot imagine, and it is still less easy to understand why plastering on wire lath, or even on wooden lath laid upon the underside of the planks, should be forbidden. As every architect knows, the most serious obstacle in the minds of owners to the adoption of the "mill" or "slow-burning" construction in the better class of mercantile buildings is the fear of their rough look, and the consequence of prohibiting the use of a neat finish of sheathing or plaster, which can hardly ever be objectionable, and may be made extremely advantageous to the fire-resisting character of the building, will simply be to drive a large class of proprietors, who look with well-founded disgust upon the yawning seams and stains and season-cracks of a plain mill ceiling, back to the old methods of construction.

THE rules about floors, again, demand that the girders shall be made of "heavy Southern pine timbers," "covered with three-inch tongued and grooved plank," and "two layers of asbestos or other heavy floor-paper," saying, however, that "in stores and warehouses an inch of lime mortar can be used instead" of the paper. Nearly every sentence of this, considered as a practical direction for a certain detail of building, is open to question, if nothing more. There is no reason why spruce timbers, well selected and seasoned, should not be used instead of Southern pine. With dimensions proportionate to their slightly inferior strength they are just as good for the purpose as the far more costly Southern timber, and are free from the vermin which large pieces of Southern pine sometimes bring into buildings. The requirement that the flooring plank should be "tongued and grooved" expressly excludes the double-grooved and splined planks which are used in nine-tenths of the "slow-burning" buildings, and which are in every way better and more economical than the sort demanded by the Boston rules. The paper over the plank may be of some use in stopping currents of air, although we have yet to be convinced that a material so incoherent as most asbestos paper, or many kinds of cheap flooring-felts, would have any great value in checking a conflagration, but the inch of lime mortar which the rule allows to be used "instead of paper" would be very injurious if employed in the way specified. Where the ceilings beneath are plastered, deafening of lime-mortar may be placed on the under flooring with safety, though even then it is better to lay paper under the mortar, and to paste another layer of paper over it, to prevent the dust of its disintegration from rising through the upper flooring; but with nothing beneath it except wide matched planks, and a thin floor above, traversed constantly in every direction by heavy trucks, there would soon be a shower of lime-dust from the ceiling of such rooms which would be destructive to goods or machinery. Probably no builder in his senses would put mortar deafening in such a floor without paper under it, but this does not make it less desirable that the official rule of the Underwriters' Union should be more carefully considered. There are other points that demand attention, but for the present we must content ourselves with expressing our amazement at another rule which informs us that in "mills, factories, stores and warehouses" "iron girders and columns are not allowed." We suppose that this must be intended to refer only to the interior of buildings, for the Statutes of Massachusetts forbid the use of timber, even "the best Southern pine," under walls; but, to say nothing of the ease with which iron beams and columns may be protected against fire by the use of wire cloth and plaster, the use of wooden posts in the lower stories of warehouses is often impracticable. To illustrate this by an example, a five-story warehouse, calculated, as such buildings usually should be, for a load of at least two hundred and fifty pounds to the square foot, exclusive of the weight of the floor, and equipped with columns, as required, of the "best Southern pine," would need to have the basement columns, if they were twelve inches in diameter, twenty-eight inches apart in the clear, supposing the cross beams to be twenty-two feet long to the centre of the girder; and, as the columns above must necessarily be placed over those below, the same crowding would

be required in at least two stories above, while in the case of a metal store, or a flour warehouse, where a load of five hundred pounds to the square foot is often placed on the floors, the spacing must be still closer. It is obvious that no owner would choke up his building in this way, and the use of iron columns and girders ought to be looked upon as a necessity, the dangers of which, from the insurers' point of view, may be wholly obviated by means known to all architects, and to most builders.

WE are glad to learn that the bill providing for the purchase of a site for the Congressional Library, and for beginning the erection of the building, has passed the House of Representatives by a large vote, and the Senate by a unanimous vote, so that there is little doubt that the matter is now practically decided, and that construction will commence at an early day. Most of our readers are already familiar with Mr. Smithmeyer's carefully-studied plans, and many have perhaps seen the modified elevations, which show a building of unusual interest and dignity, quite in keeping, as to style, with the noble front of the Capitol, opposite which it will probably stand. As has often been remarked by the distinguished Librarian of Congress, Mr. A. R. Spofford, the Congressional Library differs in some respects from any other in the world, and requires a building exactly suited to its peculiar needs. To say nothing of the enormous copyright and trademark business which the law imposes on it, the Library is in itself one of the principal objects of interest in Washington, and it is less necessary to provide for the accommodation of students and readers than for the convenient reception of thousands of visitors, who care nothing for the books or their contents, but must, in accordance with the courteous traditions of American administration, be conducted through rooms so arranged that they may gain an idea of the resources and work of the place, without coming so closely in contact with either as to interfere with the higher uses of the great library. The plan now fixed upon is the result of many years of labor and study on the part of Mr. Smithmeyer, who has, we believe, made two journeys to Europe, solely to inspect the newer library buildings there, and has been efficiently aided during the last few years by Mr. Spofford's knowledge of the special needs of our own great collection, so that we may reasonably expect the future structure to be one of the few public buildings in this country perfectly adapted from the first to the service which it shelters.

A CONVENTION is to be held in Philadelphia, commencing on Wednesday, May 12, and continuing three days, under the auspices of the State Board of Health of Pennsylvania, for the purpose of discussing matters relating to "the prevention of sickness and avoidable death, and the improvement of the conditions of living." All persons interested are invited to be present and take part in the proceedings, and a very interesting list of subjects is announced for discussion. Among those which particularly concern the profession of architecture are three, relating to the Sanitary Needs of School Buildings and Grounds, Mistakes in School Architecture, and Defective Vision in School Children, with its Causes and Management; together with one on Ventilation, one on the Hygiene of the Home, and one on Drainage and Sewerage in Country Districts." On all these subjects many architects can offer suggestions of great value, and we hope that all who are able to do so will avail themselves of the opportunity to exchange views with others, and either to contribute from their experience or to learn from that of others, in regard to matters of such peculiar importance to those who are entrusted with the arrangement and construction of the buildings in which their fellow-citizens must pass their lives. If any of our readers wish for further information in regard to the convention, they should address Dr. Joseph F. Edwards, the Chairman of the Committee of Arrangements, 224 South Sixteenth Street, Philadelphia.

MR. EDWARD S. PHILBRICK calls attention in the *Sanitary Engineer* to some of the dangers of carrying ventilation-pipes from rooms of dwelling-houses into the smoke-flues of chimneys. Every one knows that it is common to ventilate rooms by means of tin pipes running from an opening in the ceiling, over the centre chandelier, between the beams of the floor above to some neighboring heated flue, and most architects probably think that this practice is unobjectionable, but Mr. Philbrick tells a story of a case in Boston, where a pipe of this kind had been carried from the perforated centre-piece over a chandelier into the flue from an open fireplace. One day a servant threw into the fireplace a quantity of old and dry Christmas evergreens. The dry, resinous twigs and leaves blazed up, setting fire to the soot in the flue, and the flame issuing from the top of the chimney soon brought the city firemen to the house. While the men were waiting to see whether the flue would burn itself out harmlessly, flames were seen to issue from the perforations in the centre-piece over the chandelier, and the firemen, guessing the cause, cut holes with their axes through the floor above, and soon found the tin ventilation-pipe red-hot, in contact with the floor-beams, to which it had set fire.

A RATHER important question of employer's liability was discussed recently in *La Semaine des Constructeurs.* One of its correspondents is a contractor, who owns stone quarries and works them. All his quarrymen work by the piece, and are insured against accidents, in the admirable way now becoming common, by deducting the premiums from their pay. Occasionally one of the quarrymen will bring a laborer or apprentice to help him in his work, paying him out of his own pocket, and no objection is made to this by the proprietor of the quarry, although, as his contract with the accident insurance company expressly stipulates that it shall apply only to men whose names are on his pay-rolls, the strangers are necessarily unprotected in this respect. Not long ago one of the quarrymen hired a laborer to help him along with his job. In some way this laborer was injured while at work, and forthwith laid claim to indemnity from the accident insurance company under the general policy of the proprietor of the quarry. The contract of the latter with the insurance company unquestionably excluded the laborer's claim, and he then brought suit for compensation against the quarry-owner himself, who wrote to *La Semaine* to ask whether he was liable to a man not employed or paid by him, and present in the quarry without his knowledge or authority. It is worth noting by all contractors that the reply of the legal adviser of *La Semaine* is unfavorable to the quarry-owner. Although his men work for him by the job, instead of by the day, they are still, according to a decision of the Court of Aix in 1865, his agents, and not independent contractors in a way which would relieve him of responsibility for their actions. According to the decree of the Courts, a man who works by the job, or piece, is subject to the supervision and direction of the master or foreman in much the same way as one who works by the day, and being thus at all times under the control of his employer, and liable to dismissal at any moment, he must be considered as a servant, for whose acts his master is accountable. The accident by which the laborer in this case was injured seems to have been due to the carelessness of the workman who hired him, and *La Semaine* considers that the laborer has for this reason a right to demand compensation either from the workman, or from the master who is legally answerable for the workman's neglect. If the master is obliged to pay the indemnity, he has a right to collect it if he can, from the workman who committed the fault, but he can get no help from his contract with the insurance company, by which the company assumes all liability for accidents to his employés, for the policy excludes persons not named in his pay-rolls, and he is not entitled to plead the stipulation of the company in regard to his liability against a person who was not a party to this agreement.

THE *British Architect* gives an account of an interesting test of wrought-iron girders protected by wire lath and plaster, which was made by Mr. Alfred Tozer, the superintendent of the Manchester Fire-Brigade. The wire lath employed was a sort with hexagonal meshes, very inferior, we should say, to the improved kinds in use in this country. A hut was built, apparently with walls of woodwork, covered on the inside with wire lathing and plaster, and the roof, which was loaded with weights, was supported by two iron beams, one of which was left bare, while the other had wire netting wrapped around it in the simplest way, and plastered, and the ceiling was similarly protected. A fire was kindled in the room and allowed to burn for forty-three minutes. At the end of that time the unprotected iron girder had given way completely, but the plastered portion of the building was quite uninjured, the only visible damage being the scaling off of a small portion of the skim coat of the plastering.

MURAL PAINTING.[1] — X.

OIL PAINTING.



A Titian.

OIL painting is too well known and widely practised to call for any technical description. The object of these papers has been to consider the appropriateness of the different processes to mural painting, rather than to describe their technics. If unfamiliarity with some of them has necessitated a detailed technical exposition, it has been made with a view to estimate their decorative possibilities. From divers allusions dropped here and there in the preceding papers it must have been inferred that oil is not a suitable vehicle for mural paintings. In order to understand why not, it will be necessary to make a few trite chemical statements.

Oil is composed of an oil acid linked with glycerine ether; from it both glycerine and soap can be made.

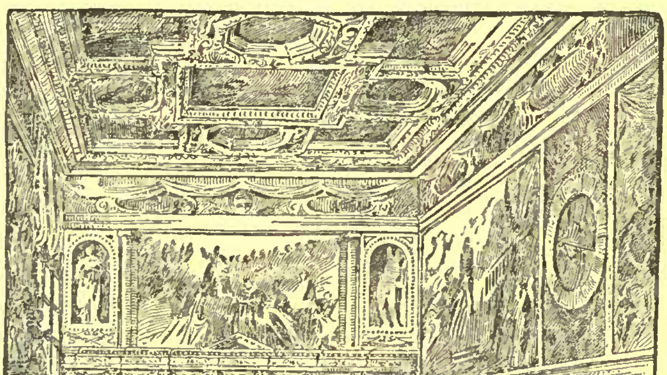
Soap is a compound of an oil acid linked with alkalies or oxides, as potash, soda, lead, zinc, iron, lime, etc. In making, the glycerine ether of the oil, with which the alkali or oxide is mixed, is set free. Some soaps, such as toilet soaps, are soluble in water — castile soap, for instance, which is made from olive oil and soda. Other soaps are insoluble, such as lead, zinc, or iron soaps, which include the pigments made by the chemical union of white lead, zinc, or certain iron paints with linseed oil. Pigments are said to be more or less durable according to their soap-making powers in combination with linseed oil. Both red lead and white lead are strong soap-makers; zinc-white, iron-ore paint, umber, yellow ochre and others are less so; while such colors as ivory-black, vermilion, madder-lake, Prussian blue, etc., do not combine chemically at all with linseed oil, or, in other words, they are not soap-makers.

Those pigments that have the strongest chemical affinity for linseed oil — the strongest soap-makers — dry and harden the most rapidly; those that have but a feeble affinity for it, or none at all, must be mixed with a drier — such as manganese or litharge — which has a strong affinity for it. While it seems to be certain that soap-making, either by the pigment itself with linseed oil, or by means of a drier, improves the solidity and durability of paint — unless it be rendered brittle by an excess of the drier — it is equally certain that all soap-making has a tendency to redden or yellow. Condit says of white lead that "it is a paint and not a whitewash only, because about one-fourth of the lead unites with the oil to form a soap . . . but it has such a tendency to redden that white lead made by a process (one of Gruneburg's processes) producing a large quantity of this part of white lead which unites with the oil would turn yellow in an hour after mixture as a paint." In one other place he says: "Strong soaps have more tendency to redden than weak soaps, when simply exposed to the air. . . . It is plain why lead changes color more than zinc: it contains more soap. Again, it is plain that boiled oil [with driers], which contains much oxy-linseed-oil-acid and much soap, will darken sooner and more completely than raw oil. To avoid change of color we must avoid that which most quickly dries and hardens the paint — soap. Even manganese driers with zinc-white will yellow the paint. It is important, therefore, for all these reasons, to use as little oil as possible in interior house-painting with white colors." It is also important to use zinc-white rather than white lead for inside work. The cure for this change of color is sunlight.

It has already been shown, in the paper on "*buon fresco*," that caustic lime forbids the use of many colors that are frequently used in oil painting. Caustic lime, moreover, combines with oil to make a soap. For these reasons oil painting cannot be used on fresh plaster. But even when the plaster is thoroughly dry, the walls should first be protected with several coats of oil paint, if they are to receive oil pictures; for even dry plaster (carbonate of lime, or chalk, and sand) changes some pigments, especially if the latter are exposed to dampness, which is almost inevitable. "All organic colors may be affected. Chalk in white lead or zinc-white easily produces a yellowish-white when mixed with oil. In addition to these changes, oil is saponified by wet chalk, which quickly becomes yellowish in the absence of sunlight. All oil-painted walls change color, and picture-frames hung on wet walls leave their photographs in reddish-yellow."[2] It is very obvious, then, that mural paintings in oil must never come in contact with plastered walls, but should either rest on several intervening coats of oil paint, or, better still, on a canvas ground fastened to the wall by the white-lead process.

The yellowing of oil is not caused by soap-making alone; it is also caused by want of sunlight. The less light there is, the yellower and darker oil-mixed pigments grow with time. Every artist must have noticed how oil sketches yellow or darken in a portfolio. As usual the cure is sunlight. Here are one or two corroborative extracts by Condit. Dr. Liebreich says that "the oil should in all colors be reduced to a minimum, and under no form should more of it be introduced into a picture than absolutely necessary." "The changes in white lead and linseed oil are rapid and inevitable. A foul, tawny yellow quickly overspreads the work, utterly destructive of delicacy and freshness." (*Quarterly Review.*)

Certain pigments common in oil-painting, such as white lead, chrome and Naples yellow, Prussian blue, English emerald green, etc., are liable to be blackened by sulphuretted-hydrogen gas, white lead in particular. As many inaccurate ideas are apparently entertained as to the influence of sulphur gases on pigments, it will be well to state the case accurately. Sulphuretted hydrogen is the product of sewage, or of animal and vegetable decomposition. A stream of this gas turned on dry white-lead paint will change it to a deep umber.[3] Professor Norton says that the "white lead blackened by sulphuretted hydrogen will bleach by the action of sunlight easily, until the oil has become perfectly hard, a process which takes several weeks. After the hardening this bleaching action is slow, but it is probable that it always continues to a greater or less extent. It is thought to be due to the ozone in the air." Fresh paint blackened by sulphuretted hydrogen bleaches rapidly, even in diffused daylight. One naturally asks, "How much danger from blackening by this gas do paintings undergo?" Perhaps less than pessimists imagine. The white-lead paint of whole neighborhoods has been blackened by sewage gas. It has also been blackened to a considerable extent in certain manufacturing districts. Bath-rooms, too, have suffered in this respect. There would, however, be no great danger from it in well-drained houses. It must be present in very appreciable quantities to blacken paint. Much that is erroneous has been written about the discoloration of pigments by the chemical action of certain gases, the product of burning illuminating-gas. These are sulphurous and sulphuric acid gases — the latter containing more oxygen. But neither blackens lead, though they both attack bronze.[4] Sulphuretted hydrogen in very small quantities escapes combustion, but hardly enough of it to blacken the pigments. What does very sensibly blacken pigments over a gas-jet is the carbon of the smoke, as every one must have observed. If the colors are thoroughly dry, the carbon can easily be removed: if not, it adheres tenaciously. Probably the heat of the gas often softens pigments mixed with oils or resins, thus affording the carbon a secure lodgment. There is also sulphurous acid and sulphuric acid in all chimney-smoke, and very probably a little unconsumed sulphuretted hydrogen. But it is the latter that blackens. The paintings by Baudry, in the *foyer* of the Opera at Paris were covered with a layer of carbon a few months after the opening of the building. It was feared that they were seriously compromised. Recently the gas has been replaced by electricity, the pictures have



Sala del Collegio, Ducal Palace, Vanica.

[1] Continued from page 173, No. 537.

[2] *Painting and Painters' Materials.* Charles L. Condit and Jacob Scheller: New York, 1883. An excellent, practical book, which treats at length of varnishes, oils and pigments, and their reciprocal relations.

[3] It was shown in Paper V, that the same stream turned on oil-white-lead mixed with the wax medium had no blackening influence.

[4] In answer to a question, Prof. Norton writes that "Gold would not be affected by the acids. I have heard it said that it tarnishes after a term of years in such a position [over a gas-light]. The side of the State-House [Boston] dome next the chimney is tarnished, as probably you are aware. Exactly why gold tarnishes in such a position I am unable to say. Probably from some sulphuretted hydrogen present in the gas which escapes the combustion."

With regard to the moisture generated by the combustion of illuminating gas, and its possible injury to mural paintings, he says: "When gas is burned, all the hydrogen in the gas, both free and combined with carbon, is turned to water. A very considerable amount of water would thus be formed. If the room were suddenly cooled, moisture might gather on the walls to a slight extent. On the other hand, the burning of gas always raises the temperature."

been cleaned, and, if we may credit the rather unscientific accounts, they are as fresh as when first painted. The discoloration of lead pigments by sulphuretted hydrogen can, to a certain extent, be removed by the action of oxidizing agents, such as hydrogen peroxide, which, acting on the lead sulphide (black), converts it into (white) lead sulphate. It is therefore evident that white lead should be replaced whenever it is possible — and certainly for the finishing coats — by zinc-white, which "is the only perfect white color," not being affected by sulphuretted hydrogen, nor yellowing, to any great extent, the oil with which it is mixed.

I have endeavored to show, as concisely as possible, why it is that oil paintings darken with age. Any one, probably, by a slight effort of the memory can corroborate this fact. I never remember to have seen an old oil picture that had not grown dark. Under certain circumstances, of an exceptional nature, which will be noted later, a slight darkening, or rather mellowing, may not be objectionable; on the contrary, it may even be advantageous; but where a light, decorative effect is intended, and especially when the surrounding tones are white or delicate in color, and have not proportionately mellowed, the effect is very discordant. Not unfrequently oil paintings are inserted in the panels of a room — a salon or boudoir, for instance, treated in white and gold. Within a very short time, perhaps at the outset, they will seem dark and heavy, as compared with the gleaming white (usually zinc-white, turpentine, and just enough oil to bind it) of the woodwork. Sometimes this is repainted after a lapse of years, while the pictures, of course, remain untouched, and this operation may be repeated, till the pictures look like black spots in comparison. In rooms of this description either the same mellowing ingredients should be used for the woodwork that are used in the oil pictures — which would annul the desired effect — or the paintings should be pitched in a whiter key than is possible in oils. But whatever may be thought about the darkening of decorative canvases or panels painted in oils, there can be no doubt about the darkening of oil pictures painted on plaster; it is both swift and sure. There is great doubt, in my opinion, whether even a heavy priming of the plaster with several coats of oil-paint would eventually protect the pictures from the action of the lime, not to mention other darkening influences. To cite a deplorable example of a prematurely and utterly ruined oil painting on a plaster-wall, I have only to name the "Last Supper" (1498), by Leonardo da Vinci. "Ignoring the old method of fresco-painting," says J. P. Richter, "Leonardo mixed his colors with oil — a fatal innovation, as it proved. Donato Montorfano's fresco of the 'Crucifixion,' painted in 1495, which faces the 'Last Supper' in the same refectory, is to this day in an excellent state of preservation, while Leonardo's production in its shattered condition is a melancholy proof of the falsity of his theory. Already his pupil Lomazzo, in his '*Trattato della Pittura*,' says of it, '*La pittura è rovinata tutta*,' [the painting is entirely ruined]. In the course of a few centuries it has been repainted no less than three times." Murray, in his "*Northern Italy*," gives some interesting information concerning the causes that led to the decay of this celebrated painting. As all the conditions attending the production of a decayed mural painting are of great import to the decorator — for they are his warning beacon-lights — and as this particular painting is world-renowned, it will be well to make one or two pregnant quotations: "Leonardo employed sixteen years upon the work; but he used a new process, which proved its ruin. The ground is plaster, impregnated with mastic or pitch, melted in by means of a hot iron. This ground he covered with a species of priming, composed of a mixture of white lead and some earthy colors, which took a fine polish, but from which the oil-color flaked off. The materials with which the wall was built are of a very bad quality, rendering it susceptible of injury from damp. As early as 1500 the refectory seems to have been flooded, owing to its low situation. The vicinity of the kitchen smoked the painting, which exhibited early symptoms of decay. . . . Scanelli, who saw it in 1642, speaking hyperbolically, observed that it was then difficult to discover the subject. . . . In 1800, owing to the drain being blocked up, and the rain falling for fifteen days, the refectory was flooded to a considerable depth. The late Professor Phillips, R. A., in 1825, examined its condition with careful and minute attention, and could with difficulty find a portion of its original surface. . . . Till this time all paintings on walls had been wrought in fresco; but oil painting, which had become known and practised in smaller works, better suited da Vinci's mode of proceeding, as it admits of retouching.[1] . . . It would appear that the vehicle which he employed, whatever it was, had no union with the ground, and, therefore, the surface cracked. At the opposite end of the refectory is a very large and well-preserved fresco of the 'Crucifixion,' by Montorfano. . . . The good condition of this painting causes one the more to regret that Leonardo did not employ fresco. His error is very curiously exemplified on this same wall. You see two white spaces in the corners. Here Leonardo painted in oil the portraits of the donors of the Cenacolo, but only a trace of the figures can be discerned." Scaling is the disease to which the disappearance of all these paintings by Leonardo in the refectory must, in the main, be attributed.



An Oil Panel by Veronesa in the Cailing of tha Sale del Collagio, Ducal Palace, Vanice.

Every student of the Vatican *Stanze* knows that two of the allegorical figures in the Hall of Constantine — "Justitia" and "Mansuetudo" — were executed in oil by Giulio Romano and Francesco Penni, from the cartoons of Raphael, and under his supervision. It would be difficult to say with authority why this experiment was made: one can only surmise. Shortly after the death of Raphael, the frescos in the stanza of Heliodorus had so deteriorated in places that they were clumsily retouched by Sebastian del Piombo. (This deterioration could not have continued, for to-day they are in a fair state of preservation.) Possibly they may have exhibited symptoms of decay in the life-time of Raphael, who may have wished to substitute for fresco an apparently more durable process. It is not improbable that he was incited to the change by Sebastian del Piombo, who seems to have been a gossip, mischief-maker, and — if I may use so unclassical a word — a "blower." This Venetian artist had established a reputation as a colorist in Rome, and his deficiencies in design were supplemented by Michael Angelo's pencil. He had executed several mural paintings in oil, and, with his accustomed brag, had doubtless vaunted their superior force and richness. (Lanzi says of his "Flagellation," painted in oils on stone in the Church of S. Pietro in Montorio, that it is "as much blackened by time, as the frescos which he executed in the same church are well-preserved.") That he was the champion of oil painting for walls, is evident from his letter to Michael Angelo concerning the decorations in the Hall of Constantine, undertaken by the pupils of Raphael just after his death. He writes (pretending to quote Cardinal Bibbiena) "that they had executed a specimen of a figure in oil on the wall, which was a beautiful work of art, so much so that no one would now look at the rooms painted [in fresco] by Raphael, that this hall would excel the others, and would be the finest work executed in painting since the time of the ancients."[2] The adoption of his favorite process by the disciples of Raphael makes "him, for the moment, fair to them, and he relates their success in glowing terms." If such talk temporarily influenced Raphael and his followers, it was but for a short time. Penni and Romano soon saw that what was gained in strength by the use of oil, was more than offset by the loss of decorative effect. The experiment was confined to the two figures before mentioned, which were suffered to remain. With this exception the hall was completed in *buon fresco*. It was not then known that mural oil paintings would blacken with time. These figures are now much darker than the others, and less sound. The lower part, in particular, of the "Mansuetudo" has badly cracked, and shows signs of scaling, while no such signs are evident on the companion figures executed in *buon fresco*, which are still fresh and far more decorative. Michael Angelo's exaggerated and explosive, though not improbable, retort to those who urged him to paint the "Last Judgment" in oils, instead of in fresco, "that oil painting was an occupation fit only for women and idlers," undoubtedly meant that he did not deem oil a suitable

[1] "He would often come to the convent at early dawn; and this I have seen him do myself. Hastily mounting the scaffolding, he worked diligently until the shades of evening compelled him to cease, never thinking to take food at all, so absorbed was he in his work. At other times he would remain there three or four days without touching his picture, only coming for a few hours to remain before it, with folded arms, gazing at his figures as if to criticize them himself. At mid-day, too, when the glare of a sun at its zenith has made barren all the streets of Milan, I have seen him hasten from the citadel, where he was modelling his colossal horse, without seeking the shade, by the shortest way to the convent, where he would add a touch or two and immediately return." Bandello; from Richter's *Leonardo*.

[2] Wilson, from the Buonarroti Archives.

medium for mural decoration — for he knew how to paint in oils. Didron says that the modern Byzantines almost never use oils for mural decoration, because they hold them to be less durable than colors applied *a fresco.* The use of oils has certainly been known to them as far back as the days of Panselinos, for Denys, his follower, gives a receipt for painting oil pictures on linen. Notwithstanding this knowledge, fresco has ever been their means of decorative expression on the wall.[1]

Modern mural painters are prone to work in oil — and by oil is meant linseed oil or a like substitute, not an essential or volatile oil, such as oil of spike-lavender or spirits of turpentine — because it is a familiar medium. Mural painting is the exception; the easel picture the rule; therefore our painters are more "at home" with the technics of the latter, which, if large, is almost invariably painted in oil. In the sixteenth century it was not so; every man of note painted on the wall, and, though there was no lack of easel-pictures, these, in many respects, were mural paintings on a small scale, having all the grandeur of monumental compositions. The "Vision of Ezekiel," by Raphael, to mention a well-known example, might be reproduced on a colossal scale, without necessitating any technical changes. The stately Italians of that epoch could not, or would not be informal. Their forms are chosen and simplified. Literal nature, as we understand it, had no charm for them. Selection, idealization, elimination (decorative necessities) were the canons of their art. Our art, on the contrary, is more picturesque and intimate, and, at times, tends to be photographic. When our painters are called upon to execute monumental works, though they may have the good sense to modify their style to suit the exigencies of the work in hand, they naturally find it difficult and irksome to emancipate themselves from their every-day methods; and if, by a vigorous effort, they do manage to change both style and method, they are not unapt to run into the opposite extreme, by producing paintings of an archaic rudeness and simplicity. So it happens that they generally find it more convenient to paint in oils, sometimes on the wall



A Puvis de Chavannes.

itself, sometimes on a canvas, to be attached to the wall afterwards. That it is better to paint directly on the wall itself, has already been shown. At times one is inclined to think that the vanity of exhibiting the work before it is placed *in situ*, has enough influence with the artist to induce him to execute it in the studio. There is one thing to be said in favor of executing studio-painted wall-decorations in oils, and that is, oil is more elastic than the other media, and colors mixed with it are less likely to crack and scale when the canvas is rolled for transportation. The best contemporary mural painters, when they use oil, reduce it to a minimum, and deaden it by an admixture of spirits of turpentine, or wax, or by painting on an absorbent ground. The mural paintings of Puvis de Chavannes (who, according to Hamerton, paints in oil deadened by spirits of turpentine[2]) are certainly decorative and scholarly in tone and conception. But why use oil at all? It is not a necessity, and the painting will surely stand better without it.

It would almost be an act of supererogation to preach light tones for walls and ceilings in these days, such a strong hold has the out-of-door feeling taken on artists. Indeed, so little profit is drawn from the peculiar qualities of oil, that one is tempted to question their use even for easel pictures. A majority of the oil pictures in our current exhibitions might just as well have been painted in wax, distemper, or water-colors. Artists are painting water-colors in oils, to put it paradoxically; but do their best they can never equal the whiteness of water-colors (or the other media) in oils, because *oil is a yellow vehicle.* There was a time when the artist, if called upon to play the temporary rôle of decorator, was apt to pitch his work in the then mellow key of the oil easel-picture. Now painters pitch their easel-pictures in the light decorative key. So much the better for decoration. Whether or not it is better for the easel-picture is quite another thing, which it would be irrelevant to discuss here. Let it suffice to observe that in abandoning the glaze, and the rich transparent tones so easily obtainable in oils, we abandon processes that immortalized the Venetians.

We are now confronted by a decorative problem of an exceptional nature, the solution of which permits the use of oils. The easiest way to state it is to give a familiar illustration, which some of my readers may have been holding *in petto* as a protest against my condemnation of oil decorations. Almost every traveller has been impressed with the actual splendor of the halls in the Ducal Palace at Venice; but the imagination must be stimulated to picture its magnificence when the gilded carving on walls and ceilings, incasing the sensuous tones of Paolo, Tintoret and Titian echoed the opulence of sumptuously-clad senators. To-day all the pomp is above, and the floor looks starved. But in those days when Venice was in truth Queen of the Seas, there was pomp above and pomp below. Glistening frames and paintings harmonized with the sheen of stuff. It must have resembled a vessel of burnished gold, with precious stones therein, reflected and intensified by the polished metal. Fresco would have been too cold, formal and spiritual to sustain such magnificence. Its pale, dead surface would have ill accorded with a gorgeousness that was Byzantine rather than Italian. A warm, shining medium, such as oil or varnish, was needed to complete the harmony. Tintoret's "Paradise" has sadly blackened with time, but it is less noticeable here. The massive gold frames counteract in a measure the darkening of years, and here we have the *rationale* of the gold frame for oil pictures. When these are not pitched in a water-color key, the slight yellowish tint induced by the oil, varnish, or time, or by all three, improves rather than injures them, provided of course, the yellowing be not carried too far. The rich, yellow tones of the frame, with its countless reflections, not only enhance the mellow tones of the picture, but they nullify the dirty quality which the same picture would apparently have if framed with pure white. It must be remembered that oil is a yellow medium, while the vehicle for water-colors, fresco and wax-painting is colorless. For the most part the Venetian paintings in the Ducal Palace are really easel-pictures attached to the walls and ceilings, not because they are painted on canvas, but because they have the qualities of easel-pictures. So, too, has the series of paintings by Rubens for Maria de' Medici, [See Illustrations.] which probably look just as well on the walls of the Louvre as they did on the walls of the Luxembourg. We must bear in mind, however, that the easel-pictures of these great masters, if not decorative in tone and chiaro-oscuro, were always monumental in form and composition. The modern painters, on the contrary, are normally decorative in tone, but un-monumental in design.

When effects, similar to those in the Ducal Palace are desired, the use of oil is legitimate. It is often advantageous to employ color transparently on metallic grounds, and then oil is a very convenient vehicle, though such a varnish as Siccative of Harlem diluted with spirits of turpentine might be substituted, perhaps advantageously. But whenever oil is used it should be with the greatest moderation.[3]

FREDERIC CROWNINSHIELD.

[To be continued.]

DECAY OF THE EGYPTIAN OBELISKS.— An early prediction (1862) of the decay of the Egyptian obelisks when removed, was made by Dr. Alfred Stelzner, of St. Petersburg. "You know, perhaps," he remarked, "that the Alexander column in St. Petersburg was transported from Finland to St. Petersburg in the thirties of this century, at a senseless cost, and, with the assistance of thousands of men, was erected. But even in a few years the granite did sad honor to its Finnish name of 'Rappakivi'—*i. e.*, the 'lazy-stone.' The granite commenced to weather, and weathered merrily on in spite of all technical and scientific commissions; and one can well say that the years of the proud monument are numbered. General Helmersen says the granite contains many large feldspar crystals. But the feldspar is triclinic, and, therefore, expands under the great differences of temperature between the St. Petersburg summer and winter, differently in the directions of its three axes; hence comes the crumbling, owing to the unequal molecular movement throughout the entire mass of the monolith. If this explanation is correct, then from the similarity of the rocks from Finland and Syene, and the great difference between the summer and winter temperature which exists also in New York, an unsuspected danger threatens the old Egyptian monolith, which has always hitherto stood in a mild and equable climate. Perhaps, also, it will succumb to the weakness of old age, for the London Needle of Cleopatra is said to be beginning already to crumble in its new home."—*Iron Age.*

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[1] "Because," said Father Joasaph, "to paint in oils it would be necessary to wait till the plaster is dry, and, as the color would not [then] penetrate the plaster, it would be less solid." This explanation — as rendered by Didron — is not altogether satisfactory. Possibly the crust of carbonate of lime, that forms on plaster, might prevent the penetration of the colors. If this were removed by scraping, the ground would be too absorbent — unless it were thoroughly saturated with oil, or an equivalent, an operation, perhaps, requiring more time and money than the Athonites could afford — and the colors, deprived of the oil that binds them, flake off, or fall off in powder.

[2] I have just received a letter from a former pupil, now profiting by the counsels of Puvis de Chavannes, which states that he [Puvis] "paints on canvas prepared with plaster [of Paris probably], which gives his work that dead surface, and uses common oil-paints."

[3] I would have liked, both in this and other papers, to institute several interesting comparisons between mural paintings — especially modern paintings — executed in different media, had I been sure of the processes. It was impossible to verify these processes except at a cost of time and labor that the result would not have justified. The only authorities that I could consult on this side of the Atlantic, either disagreed, or — from certain indications not worth noting here — did not command my confidence.

ART IN PHŒNICIA AND CYPRUS.[1] — IV.



Capital from Djezza. Height, 20 in. Diameter, 18 in.

THE necropolis near Sidon is larger than that at Amrit, but yet so small that M. Renan thinks it could hardly have sufficed for so important a town. And the presumption that the chief burial-place of the Sidonians is yet unknown to us, is strengthened by the fact that but few of the tombs or the objects found within them seem to date back beyond the time of Assyrian dominion. None of the sepulchres have preserved their above-ground members, but the subterranean plans are similar to those at Amrit. In the earliest examples neither niches nor sarcophagi were used — the bodies were laid on the floor or placed in graves excavated therein. In the later examples were found the anthropoid (or human-headed) sarcophagi, to which further reference will be made when we come to speak of sculpture.

In the neighborhood of Tyre there is still less to reward the antiquary's search. Tombs there are in plenty, but "sarcophagi, graves, niches, have all been gutted many centuries ago. Nothing more naked and bare than these tombs could be imagined." And there are no inscriptions to even suggest a date. There is but one monument in the district which excites interest — that which is locally called the "tomb of Hiram," but this, too, is without inscription or helpful sculptured detail. It resembles the Amrit monuments, but is more rudely wrought.

Near Gebal the tombs are cut into the side of the rock above ground, and entered on a level. Inside there is no decoration, but on the exterior there is sometimes a slight architectural adornment — as once, a triangular pediment with a large rosette in the centre.

Passing from Phœnicia proper to her colonies, we find at Cyprus the most interesting sepulchral relics. But I need hardly stop to describe them here — Cesnola's book is too well-known to American readers. I will only note that while M. Perrot does not, by any means, implicitly accept all the statements therein given, and speaks with much doubt of the illustrative plans, etc., he puts his doubts and objections in a courteous, graceful, truly Gallic way, that is a pleasure indeed, after all the bitter, violent, wrathful words the subject has excited in so many other quarters.

Not from Cesnola, however, but from Ross — a German explorer, who published his Cypriote travels in 1851 — our author takes the plans of certain tombs at Neo-Paphos, which show "a group of chambers connected with a rectangular court, open to the sky and surrounded by square shafts and circular columns. The court, the colonnade, the chambers attached, and the corridor by which the court is reached — all are cut in the living rock. . . . None of these tombs can be older than the fifth century B. C. The columns, with their capitals and the entablature they support, are Greek (Doric) in the details of their architecture. There is even one detail which seems to hint that these colonnades are later than Alexander — the frieze is deeper than the architrave. . . . But we are justified in mentioning these remains here, because, although their details are Greek, their plan is very different from anything we are accustomed to see in Greek tombs. We find these rock-cut quadrangles neither in Ionia nor upon the mainland of Greece; on the other hand, though none have yet been encountered in Phœnicia, several examples may be pointed to in the neighborhood of Jerusalem." "Finally, we must not forget to note that in the whole of what we may call Phœnician Cyprus, the tomb is as mute as it is on the mainland."

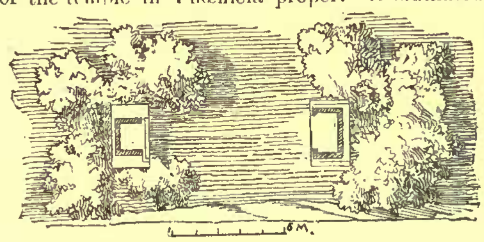
The tombs of Carthage are singularly simple and singularly unvaried. They are all subterranean, carved in the soft limestone rock. And they, too, have been so thoroughly pillaged and devastated as to tell the student little. Upon their difference of plan from those of the mother-country we cannot here dwell, nor upon the diversities exhibited in the burying-places of the colonies of Carthage. We can only recapitulate the subject of Phœnician burial in an abridgment of our authors' words: "The Phœnicians never burned their dead. From first to last, they placed them underground. With the passage of time natural grottos were superseded by artificial chambers cut from the rock. In these every variety of sepulchral bed is to be found. . . . The marked predilection shown by the Phœnicians for this method of entombment was in strict harmony with their practical, utilitarian genius; they sought for economy in everything they did; they hated all unnecessary expenditure of time, effort and money. It is, perhaps, to this trait in their character that the absence of funerary inscriptions is to be traced. . . ."

When we come, now, to speak of the religious architecture of the Phœnicians, the data are scanty enough.

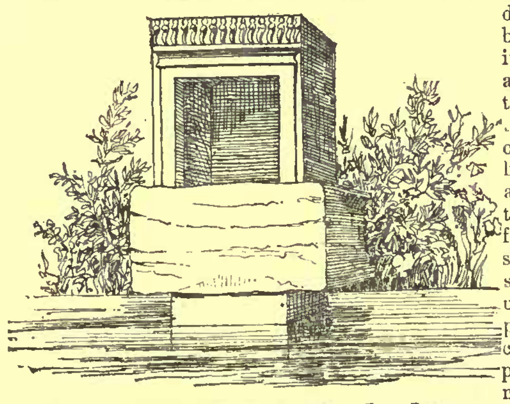
[1] *History of Art in Phœnicia and its Dependencies.* From the French of George Perrot and Charles Chipiez. Translated and edited by Walter Armstrong. In two volumes, illustrated. London, Chapman & Hall, Limited. New York, A. C. Armstrong & Son. 1885. Continued from No. 538, page 184.

The earliest religion of the tribes which peopled Syria was fetischism — their earliest devotion was paid to natural phenomena. The most ancient sanctuaries seem to have been not temples at all, but mere altars, standing probably in groves, on the top of some natural elevation. "The only temple which still exists on the soil of Phœnicia is nothing more than the reduction of an Egyptian shrine adapted to the soil and the habits of its new country." It stands at Amrit, and is a small rectangular cella, open on one side, and placed on a high plinth formed of the living rock. A single stone forms each of the three sides, and another, hollowed into a flat arch, the roof. This roof projects in front, and was probably supported by metal columns. The structure was surrounded by a platform or court-yard, levelled out of the rock; and, beyond, the rock remains to form an encircling wall, which is now some seventeen feet high in its highest portions, and was doubtless brought to a uniform elevation by the addition of hewn stones where necessary. Traces of pillars have been found at the four corners of this enclosure some twelve feet within the wall, and traces for the support of beams in the wall itself; so an interior roofed gallery, resting on intermediate shafts of wood or metal, was formerly, without doubt, an important feature of the whole. The details of the shrine itself are of a modified Egyptian character. No other temple-arrangement of this sort has been found in Phœnicia — nothing else at all, indeed, save two small monolithic shrines discovered by M. Renan, not far from Amrit in a laurel grove. Both are now broken in pieces, but a careful restoration is shown in the accompanying illustration. They faced one another, as the plan shows, but of the other features of the arrangement nothing survives.

Very little is known of the internal arrangement and furnishing of the temple in Phœnicia proper. A mutilated inscription on the *stèle* of Jehaw-Melek, king of Bylos, tells us, however, that in a temple which he built or restored there was a bronze altar (either in the temple itself or in its precincts); that gold was largely employed in the decoration of the building; and that it had a portico and columns. Votive offerings in the shape of *stèles* or figures seem to have been customary. For example, the many figures found in Cypriote sanctuaries, once supposed to be figures of deities or portraits of successive priests and priestesses, are now recognized as nominal portraits of those who came to pay their devotions and their vows to the gods, or, as M. Renan puts it, mementos of the bargain struck with the god — reminders, lest he should forget *his* part of the agreement.



Plan of the Two Tabernacles at Ain-el-Hayat. From Renan.

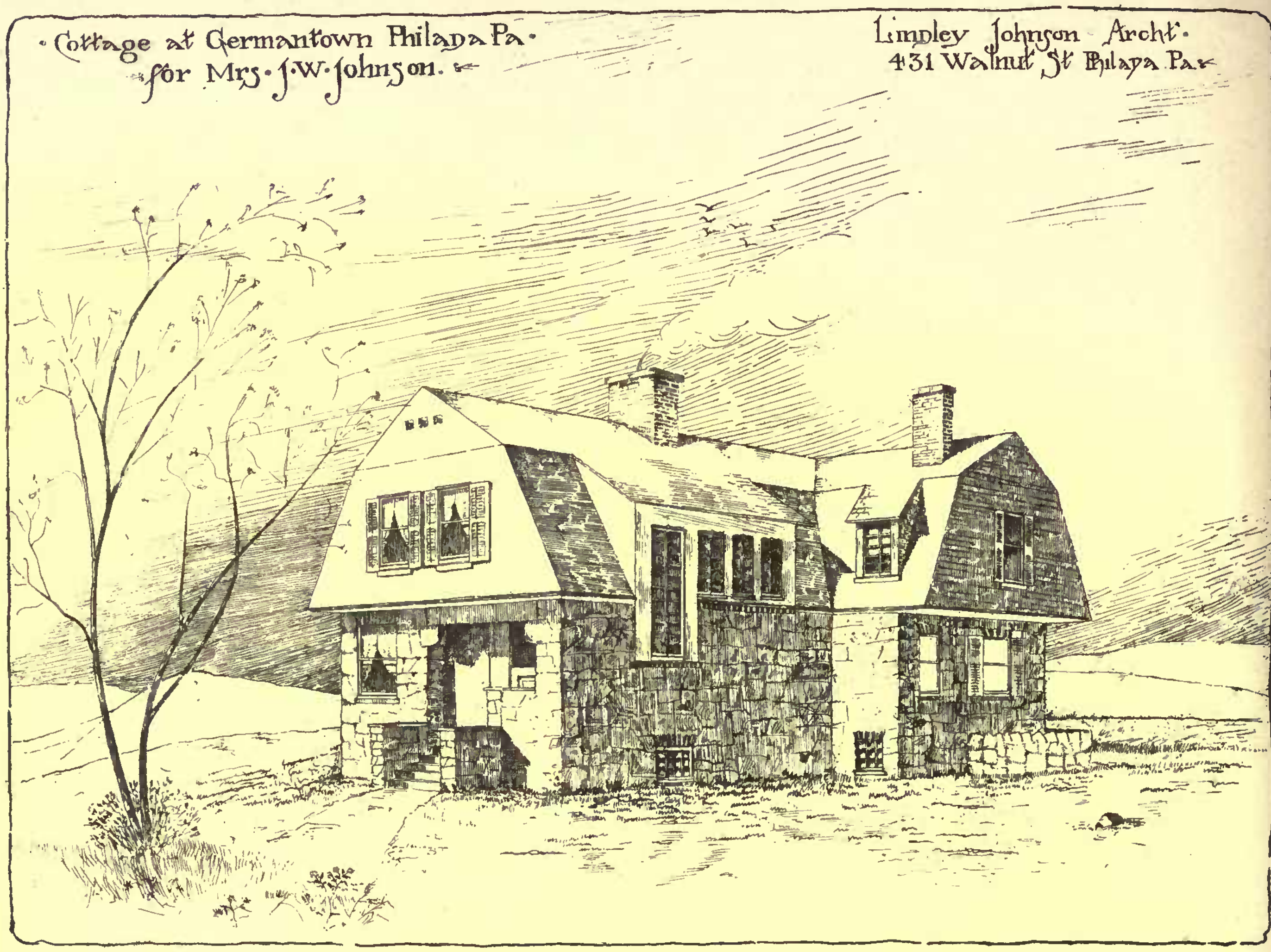


Monolithic Tabernacle at Ain-el-Hayat. From Renan.

The temples of Cyprus, as M. Perrot remarks, are thrice-famous through the words of ancient writers; but many as have been the explorations of recent years, our knowledge of them is very unsatisfactory. Again, we are warned not to trust Cesnola too implicitly, nor, on the other hand, to give too implicit credence to those whose testimony is opposed to his. And, again, I am obliged to pass over his arguments as too long and complicated for these pages.

The islands of Malta and of Gozo contain some most interesting remains. They are temples undoubtedly, and just as undoubtedly Phœnician. "We find in them none of the features which distinguish the religious buildings raised by the Greeks and Romans." The so-called "Giganteia" of Gozo — long attributed by the natives to nameless mythical or even superhuman hands — comprises two temples close together, but without any direct communication between. "Their doorways face westward and open on a long hall which binds them to each other, forming a façade for both. The axes of the two are parallel, and their plans are almost identical, but their dimensions are by no means the same. . . . Each consists of two halls communicating by a narrow passage; their shape is an elongated ellipse. In line with the outer door and the passage, the building ends in each case in a small apse or hemicycle, the floor of which is raised slightly above that of the chamber from which it opens. Each side of each chamber is finished with a similar apse, having a similar dais, giving to the whole a certain resemblance to the choir and side chapels of a modern Roman Catholic Church. . . . The right-hand apse in the first hall (of the larger temple) was reached by a flight of semi-circular steps projecting out into the body of the chamber. . . . It was here that the most unmistakable traces

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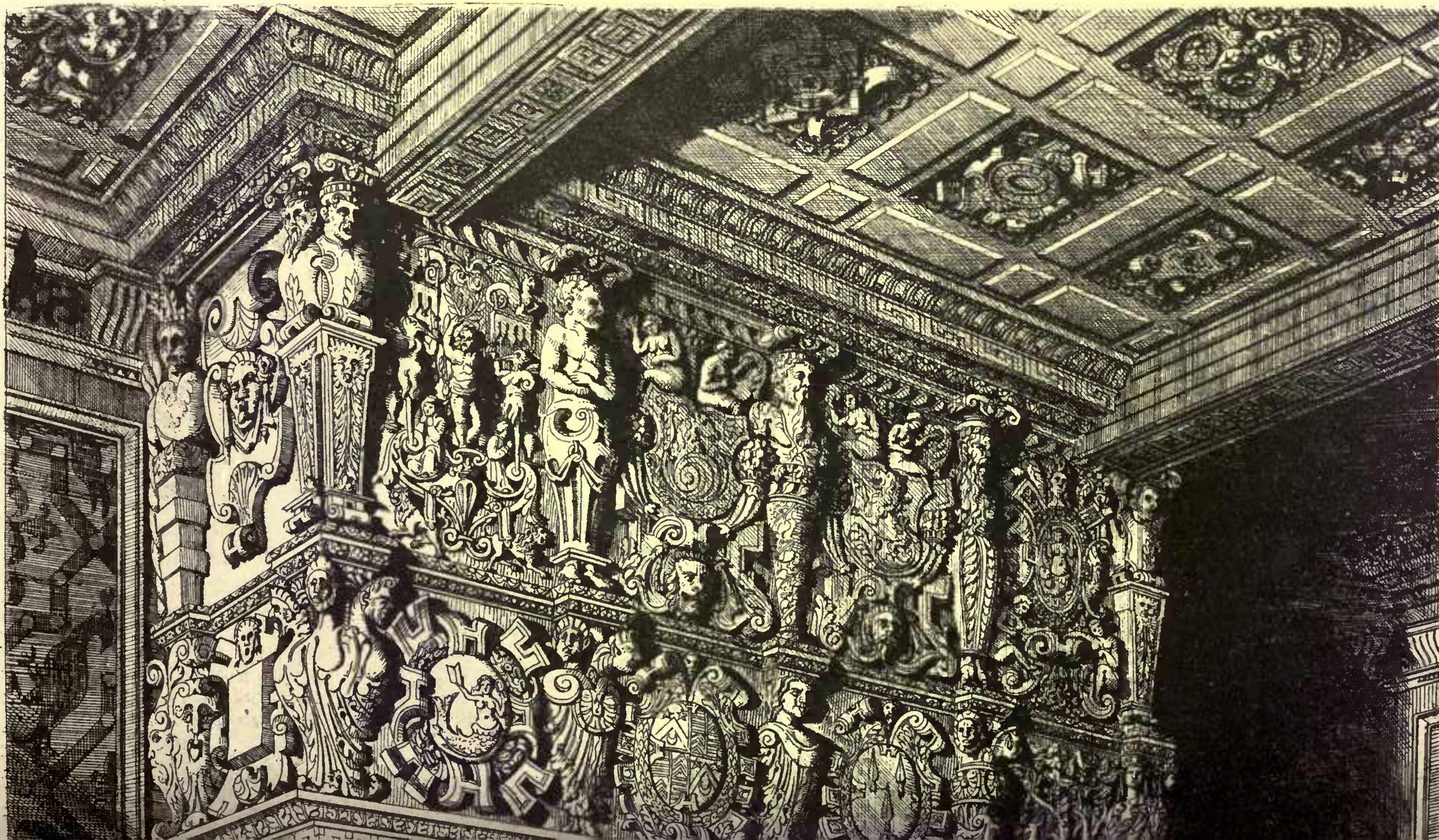
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St. Jean des Vignes, Soissons, France.

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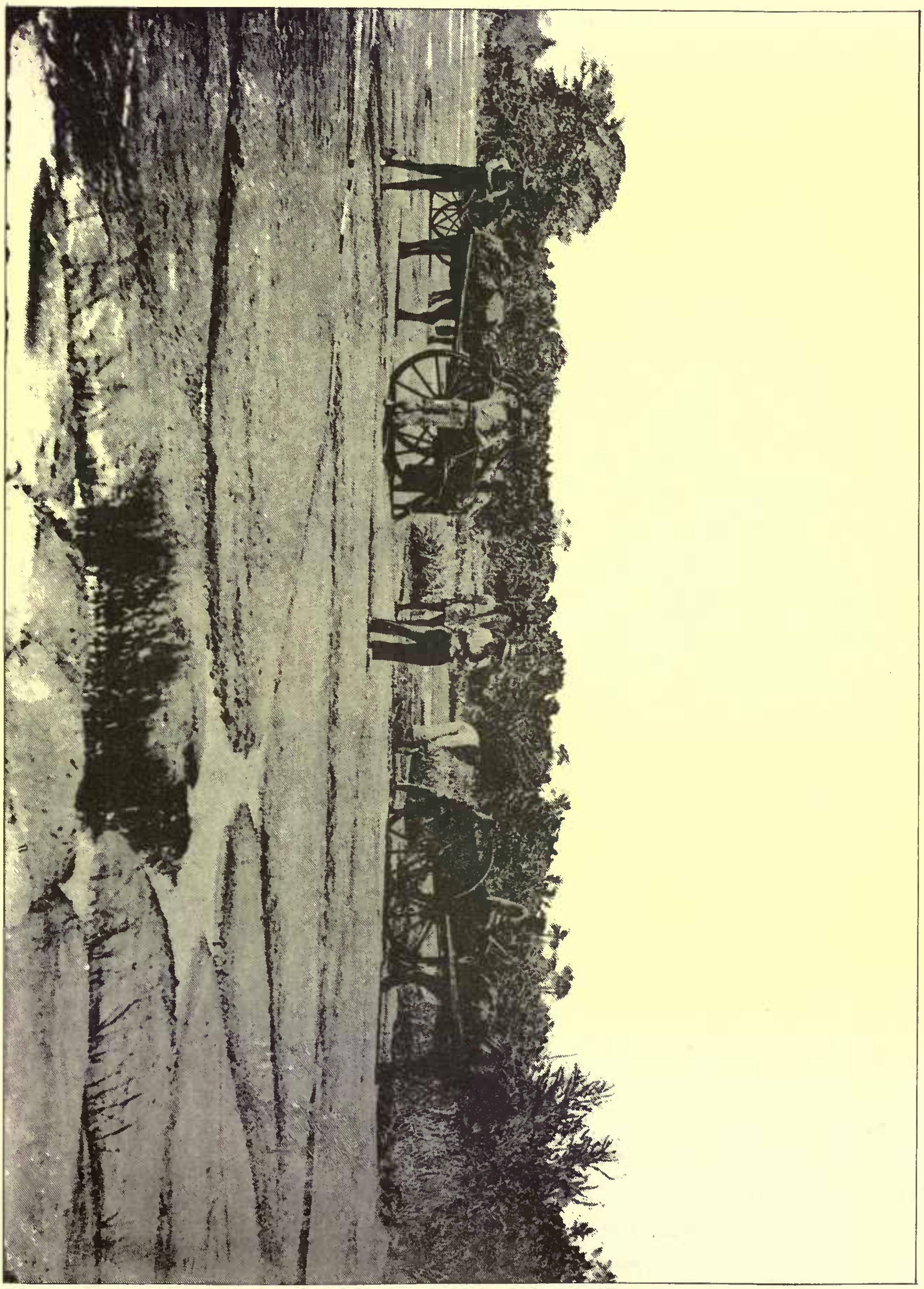
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CHEMINÉE D'UN ATELIER DE GRAVEUR

[MONITEUR DES ARCHITECTES]

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The Asphaltum Lake, Trinidad, W.I.

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Le voyage de la Reine au Pont de Cé.

La Reine a cheval le casque en tête comme une autre Bellone va prevenir une guerre civile qui se preparoit par les tumultes du Pont de Cé. Cette Princesse est accompagnée de la Victoire, et de la Renommée que sont en l'air, et de la Force qui la suit à pied avec son Lion. Le fond du Tableau est la ville du Pont de Cé, et au dessus de la ville, on voit un aigle qui poursuit des oiseaux de rapine; Allegorie qui signifie l'attention qu'avoit la Reine a dissiper les ennemis de l'Etat.



La conclusion de la Paix

La Reine ayant accepté le parti de s'accommoder avec le Roy, est conduite par Mercure au temple de la Paix. l'Innocence l'y pousse, et la Paix sur le devant du tableau brûle les instruments de la guerre pendant que la Fraude, la Fureur et d'autres semblables vices veulent s'opposer aux bons desseins de la Reine et font un dernier effort dans le transport de leur desespoir.

[After Oil Paintings by Peter Paul Rubens.]

HELIOTYPE PRINTING CO. BOSTON.



DETAILS FROM THE NEW CITY HALL, PHILADELPHIA, PA.

J. McARTHUR, ARCHITECT.

of the ancient worship — a worship in which the divinity was represented by the same emblem as at Byblos and Paphos — were found. The symbolic cone had been overturned, but its site was easy to recognize. . . . The whole building is four hundred and forty feet in circumference, and eighty-eight feet in greatest length, internal measurement. . . . There is no sign of any kind of roof. The sacred emblem alone seems to have been protected from the weather. . . . In the right-hand apse of the second chamber there is a basin cut in the rock which forms the floor; it was used, no doubt, for ablutions. [Similar basins occur in many other remains of Phœnician temples, and suggest the "brazen sea" at Jerusalem.] In front of the apse in the first hall the stones are covered with an elaborate decoration of spirals and of bosses. . . . On one block a snake or an eel-shaped fish is chiselled." The second temple is smaller and simpler, but similar in plan. At Malta, in the temple called Hagiar-Kim, we have an analogous, but less regular plan; again, with numerous apse-like projections. The masonry in both islands shows the Phœnician characteristics which have already been described — the preference for huge units and for cutting whole features, columns and doorways, for example, out of a single block.

In Sicily the Phœnician temples have left no such distinct traces of their former shape; and "in Carthaginian Africa no temples earlier than the Roman conquest have been found, but various signs prove that it possessed buildings whose decorations had certain features in common with those in other parts of Greater Phœnicia." The capital from Djezza, here reproduced, is doubtless late in date, as the general features of the design are classic. But, alike in execution and in proportion, it is characteristically Phœnician.

Carthage herself was, as we all know, twice taken by the Romans, and by them deliberately destroyed and rebuilt. No temple earlier than the time of Scipio survives, and even the early site can be fixed upon but in a single instance.

Thus, says M. Perrot, our materials for reconstructing the Phœnician temple are scanty enough. "At Malta and Gozo, where the remains are clear, we are in presence of buildings of the second or third class, which cannot be taken as worthy representatives of the national architecture." From Cyprus we may, perhaps, look for further light "when the ruins are systematically explored." But meanwhile, "in spite of the scantiness of our data, the individuality of the Phœnician, or rather of the Semitic temple, stands out with sufficient distinctness to allow the historian to grasp its salient features. It is distinguished from the most familiar of our types, that of Greece and Rome, by one capital difference; it attaches much less importance to the *cella*, the chamber in which the image or symbol of the god is placed. It consists of a great court, or open-air hall, in the centre of which, or at one extremity, rises a tabernacle or pavilion, with the emblem of divine power beneath its shelter. In Greece the attention of the architect was concentrated on the cella, the home of the god, the dwelling-place of his often colossal statue; in Phœnicia the symbol was of no great size. The grandiose feature of the Semitic temple was the *peribole* — the court-yard with its continuous portico, which in some cases included a fine order and a rich scheme of decoration." It is needless to mark the analogy between such a plan and that of the temple at Jerusalem, as described in the Bible. And our authors note its survival in the more modern temples of the Semitic race — in the old mosques of Cairo, for example, and the Caaba at Mecca. "The primitive form of worship of these people was the *courban*, or sacrifice offered on a high place, which is still practised near Mecca on the occasion of the great pilgrimage. At first, their temple was no more than a clearing of levelled earth at the top of a hill, where the altar of sacrifice was raised within a belt of trees. As civilization advanced, and the religious notions of the people became more complex, the Phœnicians borrowed from the Egyptians the idea of a tabernacle in which to lodge their fetish. . . . Thus far the Phœnician temple is founded upon that of Egypt, but it seems never to have been a servile copy. It was not hidden, like the great buildings at Luxor and Karnak, behind a huge wall; it had no labyrinth of dimly-lighted chambers lying between the sanctuary and the outer air. Perhaps through want of skill rather than want of inclination, Phœnicia substituted wide courts for the hypostyle halls of the Pharaohs."

"In spite of its simplicity, the Semitic type of temple had a grandeur and nobility of its own. . . . It was the first type to meet the pioneers of Greek civilization. . . . The Greeks began by borrowing from it, and even when, by their own genius, they had created an entirely new system of religious architecture, their buildings still preserved some traces of these early lessons. We may thus explain a peculiarity of Classic architecture which has hardly received all the attention which it deserves. The *peribole* is much more important in the Greek temples of Asia than in those of Europe. It is only in Asiatic temples, like those of Magnesia and Ephesus, of Miletus and Samos, that we meet with these vast and richly-decorated quadrangles. . . . Whether the Ionians were directly inspired by the Oriental type, or whether they took possession of temples built by their predecessors on the coast (as they are supposed to have done at Ephesus), is of slight importance. The great thing to remember is, that in certain temples belonging to this country signs of Semitic influence are to be traced even at the height of the Classic period. And the likeness was not only in the arrangement of the building. The Ephesian Artemis was the sister of the Phœnician Astarte; she was, in fact, the same nature-goddess under another name. The two conceptions being almost identical, is it surprising that the rites had much in common, and that a similar community may be traced in the buildings in which those rites were performed?"

From classic texts, rather than from actual relics, we may gain an idea of how the comparative inferiority of the Phœnician temple, as contrasted architecturally with that of Egypt or of Greece, was redeemed by a wealth of decoration and movable adornment. But my chapter is already too long, and nothing has as yet been said of those utilitarian works which are the most striking monument of the Phœnician architect.

M. G. VAN RENSSELAER.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y. MESSRS. PEABODY & STEARNS, ARCHITECTS, BOSTON, MASS.

[Gelatine Print, issued only with the Imperial and Gelatine Editions.]

IT will be interesting, we think, to turn from this print to the reproduction of the architect's successful design which we published on September 20, 1879. The present view was taken on the day when all New York, or at least the Gallic element, was celebrating the arrival of Bartholdi's Statue of Liberty. The regents of the club apparently desired to signify their own good will by hoisting the French tricolor, but the janitor blundered by flying it beneath the stars and stripes as is shown in the print.

THE ASPHALTUM LAKE, TRINIDAD.

IT is rather curious how things dovetail together sometimes: happening to be in a lawyer's office the other day, the conversation turned on the varied information which his regular practice often compelled a lawyer to acquire; in evidence of this he produced the photograph from which our reproduction is made, with the explanation that business had recently called him to Trinidad to consult about a certain asphaltum mine, and as a souvenir of his visit he had had the view taken. We thought at the time that our readers might like to see what an asphaltum mine looked like, and made a mental note for future use. Very few days after this we came upon the account in the New York *Times* of a similar visit to this mysterious and seemingly inexhaustible provision of nature, and at once saw the chance of putting two and two together. As both picture and narrative have a picturesque as well as practical value, we trust that others will be pleased that the coincidence occurred.

ST. JEAN DES VIGNES, SOISSONS, FRANCE.

OF this ruin, the Abbey church, once dedicated to St. Jean des Vignes, Mr. J. F. Hunnewell says in his "*Historical Monuments of France*," "the massive front of which, with two great towers that bear high open spires, is nearly all of the monastery spared by the destroyers during the first revolution. The townspeople then succeeded in preserving the grand fragment, still the most imposing object in Soissons. It is now kept in good repair, and parts, indeed, have been restored. The lower portions are light brown; the spires and upper parts have grown gray by long exposure. The two towers are of the thirteenth century: the spires were added afterwards. The style is early Pointed; the design is regular up to the base of a great central gable. There are three large portals; as is usual, all is boldly decorated. In the centre of the front, above the middle door, there is, much in the English manner, a great Pointed window, broad and high, from which the tracery has been broken. The southwestern tower and spire are lower and more simple than the northern. The latter can be ascended by a stone stair."

A FIREPLACE IN AN ENGRAVER'S STUDIO. AFTER AN ETCHING BY ROCHEBRUNE.

[*From the Moniteur des Architectes.*]

COTTAGE FOR MRS. J. W. JOHNSON, GERMANTOWN, PA. MR. LINLEY JOHNSON, ARCHITECT, PHILADELPHIA, PA.

STORE AND APARTMENT-HOUSE FOR MRS. ANNA B. PECK, CHICAGO, ILL. MR. JOHN ADDISON, ARCHITECT, CHICAGO, ILL.

"THE JOURNEY TO THE BRIDGE OF CE." — "THE CONCLUSION OF PEACE," AFTER ENGRAVINGS OF THE OIL PAINTINGS BY PETER PAUL RUBENS, NOW IN THE LOUVRE.

SEE article on "Mural Painting" elsewhere in this issue.

TRINIDAD'S LAKE OF PITCH.



Mask in the Vestibule of the Grand Opera House Paris.

I DOUBT whether many people know that a large share of the asphalt pavements they walk over is made from pitch brought from a natural pitch lake on the island of Trinidad. This lake is only a short distance from the sea, and the pitch oozes out of it and runs down the hill, and forms great pitch reefs that look like low black rocks. One of the largest of these reefs has been almost cut away, and the pitch carried off in vessels that came from New York, whither it was taken to be made into pavements. In writing a description of this black lake, I must begin honestly by saying that I did not see it. It is some distance down the coast, and then some distance inland, and a visit to it requires at least two days. My time in Trinidad was too short to permit me to make this trip, but I did the next best thing, and learned all the facts about the lake that I could from a gentleman who is thoroughly familiar with it.

"It is just what its name implies, a lake of real pitch," said my informant. "It covers ninety-nine acres."

"The easiest way to reach it," he went on, "is to take a sail-boat and go down the coast southward about thirty-five miles. Then, you land at the pitch point, La Brea. The first time I went there (and it is just the same now), I found the beach black with pitch. The wind nearly always blows off-shore at that point, and carries with it a smell of asphalt. Instead of the usual pebbles of stone, the pebbles on the beach were little balls of pitch. There were pools of water inclosed between the walls of hardened pitch. The soil, when we left the beach, was about half pitch and half rich earth, and the pitch oozes out in little half-liquid streams. The hot sun of this climate keeps it always soft and it is never still. In the heat of the day, from expansion, it spreads; the cooler night causes it to contract again, so it is always in motion. There were the remains of some cottages there that had sunk so far in one place and another that they had dropped to pieces. A house built of any heavy material like stone or brick would not stand there at all, so they are all made, of course, of wood, and put together so that they will stand the strain if one end happens to sink a foot or two. It is not, as you may imagine, an encouraging place to build a nice house — and there are no nice ones there. But the soil is as rich as any you would want to see, and between the lake and the sea, where it is about half pitch and half clay, everything grows luxuriantly. Plants do not grow actually in the pitch, but wherever there is a little soil, the pitch does not seem to hurt them at all. La Brea is a great place for pineapples, and they grow there larger and sweeter than any place else I know of.



An Algerian Doorway.

"I could have got a clumsy cart at La Brea," he continued, "but preferred to walk, as it is only a short distance, and by walking I saved myself a hard jolting and had a better chance to see the country. There was a fairly good road up to the lake, made of the pitch, which has been put there for the convenience of the ox-carts that carry pitch down to the coast. But this has to be renewed often, for the pitch gradually works itself down the hill and into the water, where it cools off and hardens into reefs. The lake is about one hundred and fifty feet higher than the sea level. The farther up the hill I went the more pitchy everything became. I soon reached a broad plain of pitch where the vegetation was very scant. The ground looked almost as if it had been paved with asphalt. But the lake is not visible from this plain, being farther up the hill. It was hard and hot work climbing the hill under the burning sun, stepping occasionally into a soft spot where the pitch stuck to my shoes, and very often going over my shoe-tops in dirty water, for the ruts in the road, after filling with water, are covered with the brown pitch dust, and it is almost impossible to see them. But when I did get to the top of the hill and had a view of the lake I was paid for all the trouble. It was not in a hollow like a lake of water, as I expected to find it, but at the top of an elevated place. On two sides the surrounding land is higher than the lake and on the other two sides it is lower. It was more of a sight than I had any idea of finding. I expected to see the lake covered to some depth with earth, so that they would have to mine out the pitch. But it was not. It was a perfectly black and bare pool of partly hardened pitch that glared in my eyes as the sun shone upon it. There was a number of islands, I should think about fifty feet across, scattered about the centre of it — islands of earth with vegetation on them. On the opposite side a fine growth of palm trees."

"Did you walk out on the lake?"

"Yes. I was a little shaky about it at first, for it looked as if it might stick me fast. I was alone, and if I got stuck there was nobody to pull me out. I tried it gently at first, and, finding it would hold me, ventured to walk out. I had not gone far before I came to a long, narrow pool of clear water, with some small fish swimming in it. Somebody had left a plank lying here (for I was following the dim outline of a path over the lake), and I made a bridge of the plank, crossed over the pool, and went on. But before I went far I came to another pool. There was no plank there so I sprang over it, and shortly afterward came to a third pool. The lake was seamed with little streamlets of clear water. I jumped over the third one and saw more pools all about me. I can hardly describe just how they were, but Kingsley gives a good description of the lake, and tells how these pools intersect each other. I have his '*At Last*' in the house; let me get it and read you what he says about the streams of water."

When my informant returned he read me this from Mr. Kingsley's book:

"Conceive a crowd of mushrooms, of all shapes, from ten to fifty feet across, close together, side by side, their tops being kept at exactly the same level, their rounded rims pressed tight against each other; then conceive water poured on them so as to fill the parting seams, and in the wet season, during which we visited it, to overflow the tops somewhat. Thus would each mushroom represent, tolerably well, one of the innumerable, flat, asphalt bosses which seem to have sprung up each from a separate centre, while the parting seams would be of much the same shape as those in the asphalt, broad and shallow atop, and rolling downward in a smooth curve till they are at the bottom mere cracks from two to ten feet deep. Whether these cracks actually close up below, and the two contiguous masses of pitch become one cannot be seen. As far as the eye goes down they are two, though pressed close to each other."

"That," he continued, "is a much clearer description of the surface of the lake than I could give you. The detached circles of

pitch do look just like mushrooms, and the spaces between them are filled with clear water; not only in the wet season, as Mr. Kingsley says, but all the time, as I have since learned. In the wet season the water is higher, but the cracks between the circles are never entirely dry. I call them circles for convenience, but they are in almost every conceivable shape. One of the most curious things about the lake is the fact that many detached pieces of wood seem to be floating in it. They come up from the pitch at places far removed from any trees, pieces generally about the size of a cord-wood stick, four or five feet long, and sometimes five or six inches in diameter. They come through the surface end first, leaving a foot or two sticking out, so that they look just like stumps of trees that have been burned down. They look all the more like burned stumps, because, in coming through the pitch, some of it sticks to the end and blackens it. I had heard before I visited the lake, that pieces of wood were frequently found in it partially turned into pitch."

"What do you mean by 'partially turned into pitch?' How does a piece of wood look (if you have seen any) when it is in the transition state?"

"I have since seen a large number of such pieces; indeed, I found one or two on my first visit. The sticks look very much like a piece of badly-charred timber, where part is wood and part charcoal. Only, in this case, the charred part is softer than charcoal, and may easily be impressed by the fingers. However, as I was saying, I made my way, sometimes by the use of more planks that I found, sometimes by jumping, to the islands in the centre of the lake. There were no high trees on them, but a great many low shrubs. It is not worth the trouble of going out to the islands, and I would not tire my muscles with leaping over the water-pools again, but of course I wanted to see them on my first visit. Their soil is very much like that between the lake and the coast — part pitch, part clay. It is said that these islands shift about, changing their position, number and size, but I have visited the lake a number of times since, and have never been able to see any alteration in them. If they change at all, it must be very slowly. They had told me at La Brea that beyond the islands was a spot where the pitch was soft and still oozing up from beneath. They said I would know it by the white and yellow sulphur, which there is very abundant. They might have added that I would know it by the smell. You might take a dozen asphalt pavements and melt them all down in a close room, and you would have something like it. I rather like the smell of an asphalt pavement, but this was too strong, and almost made me sick. The water between the circles of pitch was a dirty yellow, with sulphur foam; and from both pitch and water bubbles of gas were constantly rising, which smelled very bad. The pitch here was soft. Wherever I stepped, I left the impression of my shoes. It was about like an asphalt pavement on a very hot day. Some of the workmen engaged in getting out pitch have since told me that they have stood in one spot there till they were ankle-deep for an experiment; but that would be dangerous to try without some one at hand to give assistance in case of getting in too far, so I did not try it. Old accounts of the lake say that a man, by standing in one place for some time will, with his weight, make a circular depression, like a great basin, several feet in diameter. But that is not so now. Perhaps the pitch has hardened since those accounts were written. I saw, however, the fresh pitch coming out between the circles in considerable quantities. I had been told that I could put my hands into this fresh pitch without any of it sticking to them, and I found that this was true. I washed my hands in it, and they came out with nothing but the muddy water on them. I think, however, that it was on account of the mud and water that the pitch did not stick. All the fresh pitch comes up through the crevices that have mud and water in them, and, before the hands can reach the pitch, they are wet with the mud and water. If some of the pitch were taken out, I think it would stick to the hands like any other. The quantity of soil mixed with it undoubtedly injures its sticking properties, just as it depreciates its commercial value. If the pitch were chemically pure, without any earth mixed with it, I think I should be living just now in the best house in the city."

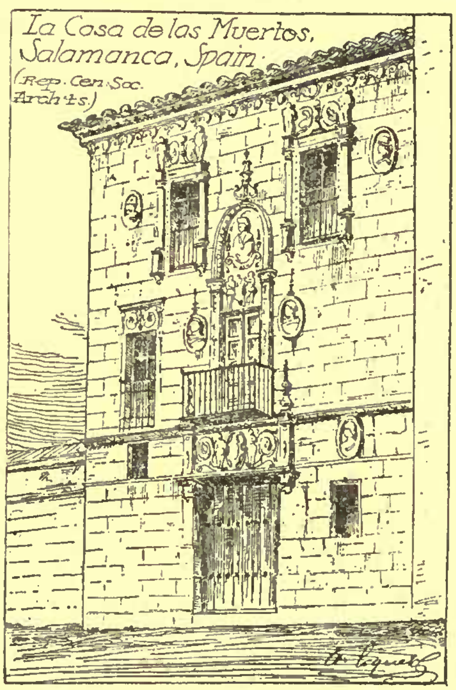
"Were any of the pitch circles movable? Could you make them vibrate?"

"Some of the smaller ones. I found several that looked, as Mr. Kingsley describes, just like mushrooms. They were spread out wide at the top, but supported by a thin stem not more than a foot in diameter. This gave them, when closely examined, very much the appearance of a small stand with a single central support. The tops of some of these were as much as four or five feet in diameter. I stood on several of them and found that they sustained my weight (nearly two hundred pounds) without difficulty, and that I could rock it from side to side. I tried the experiment I had often read of — breaking off a bit from the edge and dropping it into the water. It sank immediately, showing, of course, that the pitch does not float up from beneath on the water, but that it is forced up by some pressure. I can tell you pretty exactly what proportion of earth there is in the pitch, for it has cost me a good deal of money to find it out. It varies in different places between twenty and thirty per cent, and will average about twenty-five per cent. That does not impair its value for making asphalt pavements, in which earth and sand are always mixed with the pitch, except in increasing the cost of transportation, which is considerable for such long distances. What is taken out nearly all goes to New York or to Paris. It was thought at one time that the pitch reefs under water would be free from earth from the constant washing of the waves; but it was found to be just the same as that in the lake, for the cool water hardened it almost immediately and prevented the earth from escaping. It has to be purified before it can be used for calking the seams of ships and such purposes. I brought away some samples of the pitch with me, both hard and soft, taken from various parts of the lake, and sent them to New York to be analyzed. Afterward, being satisfied with the result, I sent several cargoes of it up, and always managed at least to get my money back. But, as a speculation, I do not think it offers very dazzling inducements. I regard the lake as one of the greatest natural curiosities I ever saw. Now I have given you an account of my first impressions of the lake, and I have not seen anything since to change them. My later experiences with it have been chiefly of a business kind. In going back I deserted the lake and skirted its shore, where the walking was easier."

"Has any one ever been caught and engulfed in the pitch?"

"There are stories of that kind, but I have not been able to authenticate any of them. The negroes in the neighborhood are afraid of the lake — have a superstitious dread of it. So have the Indians. There is a legend among the latter that the land now covered by the lake was once well-tilled ground, but that the people living on it offended some of their guardian spirits, so their houses sank in a night and the site was covered with this pitch. They still have stories of people sinking in it, but I think they are no more probable than the legend. The nearest I could get to authenticating any of them was, that a colored man started out from La Brea one night to visit a neighbor, his route taking him across the lake, and that he never returned, and was supposed to have sunk in the pitch." — *W. Drysdale, in the New York Times.*

CONCRETE.[1] — I.



I HAVE to-night to ask your attention to the means to be adopted for rendering buildings stable, and securing good foundations. This question of foundations is perhaps the most essential of any with which persons connected with buildings have to deal, for if the foundation be faulty, the superstructure, even if it should stand, will certainly suffer. It will be totally useless for the architect to design, or for the deft fingers of the mason to elaborate the most delicate window-tracery, the most graceful piers and columns, the most stately towers and domes; or for the artist to enrich these creations with the most brilliant efforts of his genius, unless the edifice be founded so that no cracks or settlements occur to deface the decorations. In some localities, as, for instance, where rock crops up close to the surface, a natural foundation is obtainable which cannot be improved upon, but in the majority of cases, and especially in London and its neighborhood, it is almost impossible to find a good natural foundation without digging to a depth that is practically out of the question on the ground of expense. Hence, it is necessary to form artificial foundations, and the material principally used for these is concrete.

Although the use of concrete as a building material is of comparatively recent date in this country, it was known and extensively used by many of the nations of antiquity. There is ground for thinking that the Greeks were not unacquainted with its use, especially in the Italian colonies of Magna Græcia, and, as far distant as Mexico, in many of those curious pyramidal buildings which are the remains of an unknown civilization, concrete foundations have been discovered. But when we come to those grand old builders, the Romans, who were, *par excellence*, the scientific constructors and engineers of ancient times, we find that they used concrete to an extent with which nothing that has as yet been done in modern times can compare. One reason for this was that the Romans found ready to their hand the best natural materials that exist in the whole world for making good concretes, viz., the Travertine limestone, the pozzolana, which is a fine sandy earth of volcanic origin, and a beautiful, clean, sharp sand. The use of concrete by the Romans dates back as far as the time of the kings (*i. e.*, anterior to 509 B. C.), and no less than five kinds of concrete walls are described by Mr. Middleton,

[1] By Mr. John Slater, B.A., being the fifth of the present course of free lectures to artisans at Carpenter's Hall, London, delivered on March 17.

who has recently devoted a great deal of careful attention to the methods of construction of the Romans. In addition to using concrete for foundations they used it without any facing for walls, which were constructed very nearly as described in Mr. Tall's or Mr. Drake's patents which were taken out a few years ago. Wooden posts were fixed in the ground about three feet apart, and boards were nailed horizontally to the posts, and then the intermediate space was filled in with concrete in a semi-fluid state, and, as soon as this had set, the boards were moved one stage higher. Thus the concrete formed one perfectly solid mass, and some of these early Roman walls are so solid and hard still that quite recently it has been found necessary to destroy them with dynamite in the course of improvements that have been made. Even when the Roman walls appear to be of brick or marble this is in every case a mere facing or veneer, and the core of the wall is of concrete. They also largely used this material in constructing very extensive vaults supporting upper floors, staircases, ranges of seats, etc. Concrete also formed the basis of all the Roman roads, and in the early examples the blocks of stone laid on the concrete were much more closely jointed than was the case afterwards. There can be no doubt that the lasting nature of the Roman concrete was due, in addition to the excellence of materials, to the careful way in which it was made, and I shall have to refer again to the method of making concrete adopted by the Romans. The French have been very great users of concrete, or *béton*, as it is there called, since the year 1820, and the material has been used in enormous blocks in docks at Toulon, Marseilles and other places, and in the construction of the mole at Algiers and the breakwater at Cherbourg. In this country concrete was employed in very early times, as, for instance, in the foundations of Westminster Abbey and in the older portions of the substructure of St. Paul's; but its use died out, and for a long while the only method adopted for making stable artificial foundations in bad soils was pile-driving. Although Mr. Semple, of Dublin, in 1876, suggested the use of a mixture of sand, gravel, and quick-lime for structural purposes, it was not till the beginning of this century that concrete was recognized as a building material. Colonel Pasley says that the first use of concrete for foundations was by Mr. Smirke at the Millbank Penitentiary in 1817, and there is a story that the discovery, or rather rediscovery, of the fact that lime would combine with gravel and form a sort of artificial stone, was a pure accident, owing to the upsetting of a barge-load of lime during the erection of Waterloo Bridge, when it was found that the loose gravelly bed of the river had been rendered hard and compact by the action of the lime.

Now, what is concrete? It may be defined as an artificial stone, composed of a mixture of hard materials, such as ballast, flints, stone-chippings, broken bricks, pottery, or iron slag, called the "aggregate," and a cementitious material called the "matrix," thoroughly combined together with a sufficient quantity of water. The value of the concrete depends almost entirely upon the quality of the cementitious material, whether lime or cement, and as it is most important that you should clearly understand the difference in the properties of various kinds of lime, I must make a short digression here in order to describe them.

You are, of course, all aware that lime is produced by burning limestone, and upon the constituents of the limestone depends the quality of the lime. First, there are the rich limes produced from stones which are perfectly pure carbonate of lime, such as the upper and middle chalk formations and white statuary marble. Lime made from these stones is commonly called chalk lime, and is much used for mortar and concrete in country districts where chalk is plentiful. This lime when mixed with water commences to slack, as it is called, *i. e.*, it swells, hisses, gives off hot vapor, and falls into powder, and if it be then mixed with water it will always remain of the same consistency and never harden at all; and as it is soluble in fresh water, mortar made of chalk lime should never be used for external work, as the action of the weather will soon render the joints quite soft; and any one who has been present during the pulling down of buildings, the mortar of which was composed of chalk lime, will have noticed how easily the bricks are separated, and what a large amount of dust comes from the demolition. Then come the poor limes made from the argillaceous or clayey limestones, which contain, in addition to the carbonate of lime, various foreign substances, chiefly silica and alumina, and often a small quantity of oxide of iron. The existence of a small quantity of these foreign substances — as in the Dorking, Halling, and Merstham limestones — causes the lime made from them to show much less violent action when slacked, and enables it to set after slacking, but not under water. Next come the blue lias limestones, which contain a greater quantity of silica and alumina, and produce what are called hydraulic limes, which will set and continue to harden under water; and after these come the so-called natural-cement stones found in the London clay formations at Harwich, Sheppy, and the Isle of Wight, or imports of Yorkshire in the clays of the oolitic series. These contain even more silica and alumina, and from them used to be manufactured the Medina and Roman cements, which had the power of hardening under water very quickly. These cements enjoyed a high reputation for many years, but they are now almost entirely superseded by the artificial cements of which Portland is a type. You may take it roughly that rich limes contain over ninety per cent of carbonate of lime; gray-stone limes, such as Dorking, about eighty per cent; blue lias from sixty-six to seventy per cent; and cements forty to fifty per cent.

When it was a well-ascertained fact that for building purposes lime obtained from the limestones containing a considerable proportion of argillaceous earth was the best, the idea began to gain ground that an artificial cement could be manufactured by mixing chalk with various kinds of clay, and calcining the mixture. The first patent ever granted for the manufacture of an artificial cement of this kind — called Portland cement from its resemblance when set to Portland stone — was taken out by a Mr. Aspden, in 1824 (who describes himself as of Leeds in the county of York, bricklayer), but the manufacture was not placed on a really scientific basis till Colonel Pasley carried out his elaborate series of experiments during the years 1826 to 1836. As so often happens with scientific discoveries, it appears to have been by pure accident that he discovered, after many failures, the superlatively good qualities of the alluvial clay or mud of the lower basins of the Thames and the Medway; this clay, which has been deposited in the tidal waters of these rivers, containing exactly the right proportions of silica and alumina for combining with the chalk. It would take too long to describe in detail the manufacture of Portland cement, but briefly it is this: the chalk and clay, in the proportion, as a rule, of about seventy per cent of the former to thirty per cent of the latter — though these proportions vary with the nature of the chalk — are ground under rollers and intimately mixed together with a great quantity of water until the mixture is of the consistency of thin paste, which is allowed to settle. The water is drawn off, and the residue is left to dry. This is then cut out in lumps and taken to the kilns, when it is burned at a high temperature, and it is very important that the whole of the mixture should be thoroughly burned. The effect of the burning is to drive off all the carbonic acid gas, and to leave the mixture in the form of clinkers. These are then carefully ground to a powder under millstones to such a degree of fineness that it will all pass through the meshes of a sieve having six hundred and twenty-five holes to the square inch. The weight of the ground cement should be as nearly as possible one hundred weight per striked bushel, and the specific gravity 3.00. The essential difference between lime and cement is that lime slacks with the addition of water, while cement does not. Lime powder after slacking will not set if mixed up with water, unless sand be added to it, while cement will set at once, and equally well in the water and the air. The property of setting quickly, and setting under water makes Portland cement of the greatest value, and its use for concrete is extending every day.

Now with regard to the aggregate. This may consist of ballast, stone chippings, broken bricks, etc., but the latter should never form the whole substance of the aggregate, and care should be taken that the pieces are not too large. In the case of ballast, it is most important that it should be clean and free from any admixture of loam or earthy substance. And there is one other point to be remembered, which is, that the concrete will be much stronger for the admixture of a small quantity of sharp sand, which will fill up the interstices between the pebbles, etc., and will make a much more solid mass of the whole.

Having thus described the materials of which concrete is composed, I now come to the mixing process, and this is a matter which is far too often neglected. We all know the good old rule-of-thumb way in which ordinary builders' laborers mix up the concrete: a heap of ballast and broken bricks is piled up, a certain, or rather very uncertain, quantity of lime is poured out on it from a sack, the water is added according to the discretion of the mixer, and the mass is quickly turned over, and wheeled and shot into the trench, and a very superficial examination is often sufficient to show numerous nodules of unslacked lime after it has been thrown in. Now this is a most unscientific and improper way of preparing concrete: the great essential is that the lime should all be perfectly slacked during the mixing of the concrete before it is thrown into the trench, and that exact proportions should be maintained.

For ordinary foundation purposes, if what is called stone lime be used, two measures should be prepared, the cubical contents of the one being four times that of the other. The large measure should be filled with ordinary ballast, and turned out on a boarded platform; to this should be added a small measure full of sand, and then a small measure full of lime: this will give the proportion of five parts ballast and sand and one of lime, and if this be well mixed and turned over after the water is added, which should be done gradually and in small quantities, it will make a very good concrete for ordinary purposes. If the ballast and sand, before the admixture of the lime, amount to a cubic yard, it will be found that about thirty gallons of water will be required to mix it thoroughly. This mixture should be then wheeled and thrown into the trenches — not from a great height, as used to be considered essential, for, if so, the heavier particles tend to fall to the bottom first, and the mixture will not be so well amalgamated — levelled and rammed. The French method of making concrete, or *béton*, which is almost exactly the same as that adopted by the old Romans, is undoubtedly superior to ours. They invariably mix up the lime and sand to form good mortar *first*, and then mix in the pebbles with it. A heap of good stiff mortar is first prepared with a moderately hydraulic lime and sharp sand; a barrowful of pebbles, which have been washed, is then spread out on a platform; over it is spread a barrowful of mortar, then a second barrowful of stones, and then another of mortar, and the whole is turned over with spades and dragged backwards and forwards with rakes till the pebbles have become thoroughly enveloped in the mortar, and the whole mass is then thrown into the trenches. An extra

precaution against deterioration of the concrete by contact with loamy earth is adopted in the best work by covering the bottom of the trench with another layer of sharp sand. The washing of the ballast is an excellent thing, as it tends to clear it from any earthy particles that may have become mixed with it. There can be no doubt that this is a far more scientific method of making concrete than the former; if the mortar is well made, you get the pebbles more thoroughly amalgamated, and you ensure that the lime shall be thoroughly slacked before the concrete is spread; but it is also more expensive, and I should not consider it necessary to use this method in ordinary cases. But where the soil is very wet, or in any case where the stability of the foundation is of very great importance, I should always recommend the use of cement concrete. With ordinary care in mixing this, supposing the materials are of good quality, you know you can rely upon its setting quickly and forming a perfectly solid foundation, and you need be under no apprehension of having it spoiled by the inroad of water. The cost is more than that of lime concrete, but not so much more as the difference in cost of lime and cement, because you can use less cement proportionally. Six parts of ballast, one of sand, and one of Portland cement will make a concrete good enough for almost anything in the way of foundations. Care should be taken that not too much water is used. Faraday, the eminent chemist, said that in the production of concrete the great thing was the discreet and accurate use of water: if too much be used it will wash the cement away from the particles of the mass before it has time to become thoroughly indurated. If the trench in which the concrete is to be spread is not too deep — that is, not above eighteen inches — my own opinion is that you will get a harder and more solid mass by filling it up at once to the full thickness, and not putting the concrete on in layers: but if you have to put the concrete five feet thick, it must, of course, go on in layers. In any case, it will be much improved by being well rammed after levelling. In such a material as concrete there must be a large number of minute air spaces — you can see them with the naked eye in concrete that has set — and the act of ramming will drive out much of the interstitial air and make the particles of the mixture more compact, and the denser such a material is the stronger it is. Numerous experiments have been made to ascertain the loss of bulk in making concrete. Professor Hayter Lewis found that twenty-seven cubic feet of Thames ballast mixed with four and one-half cubic feet of lime and forty gallons of water, made exactly one cubic yard of concrete; and in some tests made by the Royal Engineers, it was found that twenty-seven cubic feet of broken stone, nine cubic feet of sand, four and one-half of Portland cement, and twenty-eight gallons of water exactly made a cubic yard. The difference between the two experiments may be accounted for entirely by the presence of the sand in the latter case, because the probability is that if a measure containing a cubic yard were filled with broken stones or ballast, it would still hold eight or nine cubic feet of fine sharp sand, because the pebbles will not lie close. It is sometimes stated that concrete expands after being mixed; if it does it is because it has been improperly mixed, and any expansion that takes place after mixing can only cause some disintegration to take place.

[To be continued.]

BOOKS AND PAPERS.

AS we recall the eager expectancy with which we rummaged in boyhood amongst the contents of the paternal library, more rich in books of theology and philosophy than in works of fiction and the imagination, we picture the delight with which we might have found — as we hope the boys who are coming after us and are now upgrowing actually will find — stored on a topmost shelf such a collection of standard works as that which Messrs. Cassell & Company are now publishing in such good style and at such an extraordinary price in their "*National Library*."[1] The gormandizing days of boyhood are the proper time, we find, to thoroughly enjoy those minor English classics which every one knows by name, but which one does not, later in life, find time to take up, nor to thoroughly enjoy if he do, as we found when for the first time we had, last night, the opportunity of running through Horace Walpole's "*Castle of Otranto*," as familiar by name to all readers, as Walpole's fantasy at Strawberry Hill is familiar to all architects. Silvio Pellico's "*Ten Years' Imprisonment*" brought back, when it came to hand, long-forgotten associations with Sunday reading and Sunday-school lessons, just as the "*School for Scandal*" and the "*Rivals*" revived recollections of college theatricals. The feeling excited by the "*Autobiography of Benjamin Franklin*" were most akin to those we have felt as the victim of an April fool's day hoax, for we were chagrined to find ourselves so uninstructed in polite literature as to be surprised when we found that the "*Autobiography*" was brought to an untimely end at the close of the author's fifty-first year, just as he was entering on his brilliant European career. Henry Mackenzie's "*Man of Feeling*," to which has been prefixed by the editor an "Index to Tears (chokings, etc., not counted)," which gives a key to forty-seven lachrymose passages, we have not found time to read, but we have, in turning over the pages, found one or two passages where the Man of Feeling "pipes his eye," which have escaped the editor's enumeration. After we have read this mournful tale, we expect to be in the proper frame of mind to attack the many volumes of "*Clarissa Harlow*," which for the last score of years we have always "meant to read." "*The Voyages and Travels of Sir John Maundeville, Knight*," who, in the fourteenth century, travelled, in the fear of God, through the East, is a refreshing tale to the modern reader who knows his geography, theology, zoology, ethnology, sociology, and all that, and who will find his respect for Prester John much like that he entertains for Pope Joan. Still the tales of magnificence told by this simple traveller have the power to stir the smouldering embers of romantic belief. Hugh Latimer's "*Sermons on the Card*" we treat with the respect due to his great name and his sturdy steadfastness, but we beg to be excused from following his discourses, because — well, we will say because it is humiliating to find how much of one's Latin can be forgotten, and it does not seem to be quite fair to read the reverend gentleman's sermons unless one can follow the thread of his discourse when he frequently lapses into a form of speech more familiar to monks than editors.

Though we know something of the cost of manufacturing books, we find it none the less extraordinary that the publishers are able to sell such extremely creditable booklets for the price they have fixed. If five dollars can bring into a man's hands fifty-two complete, neat, wholesome standard works of the minor-classic type, we think he must be a very narrow and one-idea man who will let the chance pass by. For our own part we are extremely grateful to the publishers for sending them to us, and we look to being able to pick up many dropped literary stitches in this way, and receive both instruction and enjoyment while so doing. With one hundred dollars in hand, think what a library a man can nowadays place on his shelves, thanks to such publishers as Bohn, Tauchnitz, and now the Cassells, and their editor, Professor Morley!

[1] "*Cassell's National Library*," Edited by Prof. Henry Morley. Ten cents per copy, five dollars per year. New York: Cassell & Company, 1886; "*Childe Harold's Pilgrimage*," by Lord Byron; "*Autobiography of Benjamin Franklin*"; "*My Ten Years Imprisonment*," by Silvio Pellico; "*The Rivals and a School for Scandal*," by Richard Brinsley Sheridan; "*The Man of Feeling*," by Henry Mackenzie; "*Sermons on the Card*," by Hugh Latimer; "*The Castle of Otranto*," by Horace Walpole; "*Voyages and Travels of Sir John Maundeville, Knight*."

COMMUNICATIONS.

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

WAS THE ROOF OF SOLOMON'S TEMPLE FLAT OR SHARP?

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — The Hebrew term for roof is *gag*; and the Greek for this, in the Septuagint, is *doma*. Now, if we could show that these words both mean a flat roof — in and of themselves have this meaning — we should think that our question is at once answered. But the fact is, that it is nowhere stated, in the Scriptures, that either the temple or capitol had any roof at all, whether flat or sharp. So the first question is, Had these buildings any roofs? They both had windows; for this fact is so stated in words; and these would be of no use if there were no roofs. We know that the two buildings were similar to each other, and that the capitol, on its inside walls, was wainscoted "from the floor clear up to the floor," which can only mean that the walls were sheathed from floor to roof — from the horizontal flat floor below to the horizontal flat roof above.

The twice-three watch-towers at each one of the twice-three gates of the temple's courts had windows; and hence we know that they had roofs: but we are *told* that they had roofs (*gag*, Ezekiel xl. 13). Now symmetry requires that the temple should also have a roof (*gag*) — a flat roof; not a sharp one.

Columns are mentioned as on the inside of the temple; and these imply a roof to be supported. The Talmud speaks of the "roof" of the temple by name, and Josephus tells us of the "top" of the temple.

That the roof of the capitol was flat we have already seen indicated, by the term "floor," which is applied to it: it was a floor overhead — indeed, was used as a floor, as we shall soon see. Just so a "threshold" below and a "lintel" above are both called *saph* in the Hebrew of Ezekiel xl. 6, because a threshold and lintel are so much alike. So, too, the Hebrew for the "thumb" of the hand and "great toe" of the foot is the same word.

As for the roof of the temple, it must have been flat, because the house, that is, the temple, was thirty cubits high. It is not said that it was thirty cubits high at one point or on one line, as at a ridge-pole; but thirty cubits high, that is, wherever the measure be taken. It was thirty cubits (45 feet) high over the nave, certainly; for so it is stated; and the heights of the walls of the galleries and foundation give a height of thirty cubits at the eaves; and hence, again, the roof must have been flat.

In the Talmud the temple has a battlement; and a battlement (in Deuteronomy xxii. 8) was to keep people from falling from the roof (*gag*): people on a roof imply a flat roof.

The three thousand men and women on the roof (in Judges xvi. 27) imply a flat roof. So do the booths on the roof (in Nehemiah viii. 16); and David's walking on the roof (in 2 Samuel xi. 2): compare Joshua ii. 6; 1 Samuel ix. 25; 2 Samuel xvi. 22, etc.

There is nothing said about a roof, in the Scriptures, implying a sharp roof: a flat roof is often indicated.

We have no right to put a Grecian or other sharp roof of the West on the flat or partially dome-roofed houses of the East.

But what makes it certain that the temple had a flat roof is this: that the height over the floor of the nave and oracle, in one measure, is given as thirty cubits (45 feet), and the several wall-heights ($5 + 5 + 5 + 5 + 10$ cubits $= 30$ cubits $= 45$ feet) added together make thirty cubits at the eaves all round the four sides of the house.

Water will run from a roof paid over with pitch, and made as flat as any good workman would be likely to make it. It requires the greatest possible mechanical skill to level a billiard-table. But the flat portions of the roofs in Palestine slope slightly; we can see how much they slope by looking at photographs of roofs in Jerusalem.

P.

TOPPING-OUT CHIMNEYS.

To the Editors of the American Architect:—

Dear Sirs,—In topping-out chimneys with a drawn-in top, does the brickwork need to be eight inches thick above roof, when it is four inches below? For instance, such a one as is in the last number of the *American Architect* (No. 538), by Messrs. Chamberlin & Whidden's design. M. F. D.

[We hope that if the chimneys referred to have eight-inch walls above the roof, they are equally thick below it. If our correspondent means to ask if a chimney-top can be drawn-in when only four-inch brickwork is used, we will say that a good bricklayer will have no trouble in doing it.—Eds. American Architect.]

THE BEST KIND OF DRAIN-PIPE.

Portland, Oregon, April 13, 1886.

To the Editors of the American Architect:—

Dear Sirs,—Will you kindly answer the following questions:

For house-drainage and street-sewerage, which of the two, glazed terra-cotta or cement pipes is most used, and which of the two is prefered as to sanitary reasons? If the preference is for cement pipe, what is the composition of the cement pipe.

Yours respectfully, W. H. Williams.

[Salt-glazed Akron sewer-pipe is unquestionably the best from every point of view. Cement pipe has so often proved unsatisfactory that it would be advisable to use it only when the Akron pipe can not be had. Slip-glazed pipe should also be avoided.—Eds. American Architect.]

NOTES AND CLIPPINGS

The Chicago Board of Trade Clock.—The works of the immense clock which has been put up in the Board of Trade Building in Chicago are pronounced a most perfect reproduction of those of the great Westminster Palace clock in London, but with some additions and improvements adapted to its commercial purpose. It is constructed of iron, bronze and steel, and weighs ten tons without the bell, the latter adding some 4,500 pounds. The pendulum alone weighs 750 pounds. In its arrangement the works are divided into a time-train, a hand-train and a striking-train, these several trains comprising separate machines, resting side by side on separate frames. Each of the trains is operated by a separate weight, and the three weights together reach some 3,500 pounds. The hammer that strikes the bell weighs some eighty pounds, the clock-work is below the dials, which are ten feet ten inches in diameter, and the bell is above them, or 250 feet above the ground. The pendulum swings one way in two seconds.—*Exchange.*

Protecting the Ancient Monuments in Italy.—A bill concerning the protection of "historically and artistically valuable monuments, as far as such belong to the periods before the end of the eighteenth century," is before the Italian Parliament. Without using the words, a distinction is made between movable and immovable monuments. The latter, viz., antique temples, theatres, streets, houses, etc., are to be expropriated in such a manner that the Government pays for the ground and excavations, but not for the antiquities themselves. Movable antiquities, on the contrary, such as statues, cameos, etc., remain in the possession of existing owners, with the limitation that the Government has not only the first right of purchase, but the right to compel, if desired, the sale to it of the objects. In order to export antiquities, or to excavate, a duty of twenty per cent must be paid, and the consent of the Government obtained. Antiquities that have become the property of the State may not be resold.—*London Daily News.*

TRADE SURVEYS

The frequent complaints of unsatisfactory trade are offset by the comforting assurances of manufacturers, builders, projectors of engineering, and other enterprises of great activity. While retailers and wholesalers, including jobbers of products and merchandise of all kinds, are not meeting with that demand during the latter part of April, which they had expected, and to which they are accustomed, the manufacturers of machinery, engines, tools and equipments of various kinds, the builders or locomotives and of coastwise tonnage, the builders of bridges and of railroads, are all meeting with an increasing demand for their services. A birds-eye view of the industries furnishes these salient features: First, that the general industrial condition is at about a stand-still; that within the past week or so numerous inquiries for material have been received; that two or three important railway enterprises have been put upon good financial footing; that the strikes are dying out and labor is generally at work. As to probabilities, the most noticeable are the expansion of demand in all trade circles, the improvement in orders for material at iron and steel works, in lumber, wool, coal and in general hardware and in agricultural implements. Consumers have preferred for the past month to buy cautiously, but are now evidently inclined to purchase more liberally. It is only necessary for one or two industries to make a start: a spirit of readiness exists and many others are ready to follow. Building enterprise has received a slight setback here and there, but a general summing up shows a healthy condition. The flood of permits and of projects and new enterprises of all kinds continues, the common-sense of the business and manufacturing public is leading the great body of the people steadily along in the pathway which was mapped-out last year. The manufacture of lumber so far this year has been carefully guarded, but with all there is an increasing consumption and stocks are declining in all primary markets. Wholesalers have, within the past week, endeavored to strengthen prices by a sort of informal agreement among themselves in New York and Philadelphia. If there is any actual improvement in prices, it has been made in hard woods. Furniture factories, sash, door, and blind factories, saw-mills, planing-mills and all wood-manufacturing and wood-working interests have been kept busily employed to meet the enlarging demand. In the department of bridge-building a great deal of activity is near at hand, and makers of bridge-iron, particularly in Pennsylvania, are in negotiation for unusually large supplies of material. Bridges are to be built across the Mississippi River at Winona, Minn., Red Wing, Minn., Keithsburg, Ill., near Alton, Ill., and as previously stated there are enterprises on foot looking to the construction of bridges at Cairo and at Memphis. Bridges are also to be built across the Missouri at St. Joseph, Saline City, Council Bluffs, St. Charles, Atchison, Chamberlain, Dak., and at Pierre, Dak., besides two or three other points. Bridges are also to be built across the Cumberland and Tennessee, and one across the Ohio at Cincinnati, besides numerous bridges over smaller streams, running from one hundred to three hundred feet in length. These favorable indications of activity are supplemented by the inauguration of railway-building enterprises and by the placing of a few large steel orders this week. Throughout the West building enterprise is at fever heat, excepting here and there where builders and projectors are waiting for industrial quietude. More or less enterprise is halting in St. Louis, and architects and building authorities there say that throughout the Southwest a great deal of temporary damage has been done, but that it is probable that lost time will be fully made up by midsummer. The labor disturbances there are practically over, and in all other localities disturbances are clearing up and everything points to the restoration of peace soon after May first. There is still the possibility of a general eight-hour strike on that day, however, but the best-informed authorities in the country do not regard a general unsettling for the reason that in most trades arrangements have been made as to the wages and hours of labor. The labor unions do not wish to precipitate a conflict, and will be content with what they have already accomplished. The semi-crisis through which we have passed, shows our strong foundations and will give greater confidence to capitalists in the future when industrial disturbances are threatened. The labor organizations are rising to a proper comprehension of the problem before them, and are proving that their leaders are fairly intelligent and conservative and not too inclined to lead their followers into dangerous paths. In commercial circles, the reports from all leading cities do not indicate the expected improvement. The volume of freight moving from Chicago eastward is exceptionally light. The westward business is correspondingly light. In banking circles, the moderate demand for capital is permitting a slight accumulation of funds, but nothing of a speculative character has been manifested. The possessors of capital, though responding quite liberally to the calls for money in the West and South, are still remembering the unwelcome treatment in the one section and the repudiating conduct of public borrowers in the other. It appears that in Michigan steps are to be taken to drive out Eastern capital on the extremely short-sighted plea that home capital can command higher interest. The West is what it is because Eastern capital has made it. Rapid as has been the development of the industries in the South, that section would have been much farther along had its political spokesmen insisted upon the honoring of all their obligations. Eastern financial centres are full of money, but strikes, the remembrance of repudiation, the disposition to tax what is called for in capital, and some other influences are making lenders extremely inquisitive as to all applications. There is an abundant field for idle capital West and South, and the investments which have been made within the past year or two are mainly turning out well. The building news for the past week continues to be of a very encouraging character. Efforts to gather information from some of the smaller towns throughout the New England and Middle States, ranging in population from 5,000 to 20,000, have resulted in showing not merely an ordinary but an exceptional activity in the building of houses for artisans, clerks and business men and manufacturers of small means. Throughout the West the building-loan-association plan is working steadily, and is accomplishing great results. It is finding a welcome in many smaller towns, and private capital is disposed to compete with it in the demand for house accommodation.

Prices of all kinds of products are likely to remain firm. Breadstuffs decline to weaken just at present; manufactured products will necessarily remain firm in price because of the greater control exercised by manufacturing combinations over supply. The outlook for the coming sixty days might be better, but considering the agitations to which the country has been subjected, the demand now coming in and the inquiries being made, and the evidences of activity manifested, all go to show the producers of values in every branch of activity that but little fluctuation of values is probable. The natural result of the unsettled trade conditions of the past few weeks is increased activity during the next two months. Manufacturers are increasing their capacity in nearly every branch. Iron and steel makers are putting up mills and furnaces; makers of saw-mill machinery were never busier; the same is true of wood-working machinery makers, and of makers of machinery in general. The failures for the past week show a slight falling off in number, and the loans of banks do not indicate any increasing demand for money in that channel.

Oiling Wood.—Wagon-makers or repairers can save their stock from worms by oiling with linseed oil. Singletrees, doubletrees, neck-yokes, spokes and cross-bars that are of white hickory, and are kept in stock for a year or more, will be eaten by worms if not kept in a dark place or otherwise protected. Coal and kerosene oil are good also, and the expense of applying is but little. Linseed oil is preferable, as it acts to some extent as a wood-filler, filling the pores, and thus aiding the painting which follows in its proper place. Some manufacturers oil all their white-hickory stock before shipping.—*Lumber World.*

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THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y.
PEABODY & STEARNS, Architects.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 540.

MAY 1, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

WE learn with deep regret of the death of the most noted of American architects, Mr. Henry H. Richardson, who expired last Tuesday night at his home in Brookline, after a brief illness. Mr. Richardson was born in Louisiana in 1838 or 1839, and was therefore in the very prime of his artistic powers at the time of his decease. His short life had been in some respects an eventful one. Brought up as the petted son of a rich and distinguished Southern family, his natural capacity and ambition soon began to show themselves, and he was sent North, after his early education was completed, passing four years in college at Cambridge. Graduating at Harvard in 1859, if we recollect rightly, his artistic instinct led him to interest himself in the study of architecture, and immediately after leaving college he sailed for Europe, and entered the École des Beaux-Arts in Paris. At that time American students were rare in Paris. Mr. R. M. Hunt had pursued the course in architecture with distinction, and had done some professional work in Paris, but had at this time, we believe, returned to America, so that Mr. Richardson found himself alone. His ability and enthusiasm however, soon made him friends among the other students, and for seven years he lived on terms of the closest intimacy with the best men in the school. He retained, of course, his pleasant relations with his American friends who visited Paris, and was happy in being able to be of service to another American student, Mr. Lindsey of New York, who entered the school some years later, but in all other respects he was a Frenchman with his companions, sharing their ambitions and helping them in their work, and taking part in the interchange of ideas which young French artists enjoy so much. In one respect, however, he kept consistently in view his future career in his native land. Although he was soon distinguished for his cleverness, and won numerous honorable mentions in the regular *concours*, he refused to compete for any of the school medals and prizes which were open to him, preferring to exercise himself in as great a variety of work as possible, rather than devote months to the study of the single subjects assigned in the contests for prizes.

ENTERING the school as a rich young amateur, the work of his earlier years, although full of energy and enthusiasm, was naturally somewhat interrupted by the requirements of society, as well as by the details of the collection of a professional library, which he had begun, and was adding to with the discreet liberality of a connoisseur with ample resources. In the second year of his residence in Paris, however, the American civil war broke out, and his communication with his family in Louisana was soon broken off, not, however, before he had learned that the fortune of war had reduced his parents to poverty, and that he must thenceforth depend upon his own resources. This misfortune, sudden and terrible as it seemed, proved in the end the making of a great architect, as well as of a man of uncommon force of character. He found himself in a foreign city, surrounded by luxuries, but with only a few francs of ready money, and no prospect of getting any more except by his own exertions. His courage, however, soon rose to the emergency, and he prepared for the battle of life with a resolution which few men, thrown penniless upon the world, would have shown. Such books and pieces of furniture as had not been already paid for were sent back to those who sold them, and the sacrifice of a large portion of the others supplied him with the means of supporting himself for a few weeks while he looked for employment. Naturally enough, he applied first to his instructors in the school, and was rewarded for his unselfish industry during his years of opulence by the offer, made through his *patron*, M. André, who still lives to mourn his loss, of a modest position in the office of one of the Government architects, where he toiled through the long hours of a French draughtsman's day, beginning again at night with his work on his problems for the school, with which he still maintained a close connection. In this way, poor, but happy in his work, and in the affection and applause of his fellow students, the young American completed his seven years of school life. His position in the Government office had by this time improved, and he had secured what the French consider a good opening in life, but, notwithstanding the entreaties of his companions, he resolved to give up his prospects in Paris, and try his fortune once more in the country to which his deepest sympathies drew him. Returning to New York, he established himself in business, and by the slow steps which every young architect knows, he built up a reputation which has until now never ceased to brighten and increase. His first commission of importance was the Boston & Albany Railroad office-building at Springfield, a beautiful structure, of Italian Renaissance style, and he built soon afterward two churches in the same place, the North Church and the Church of the Unity. These had hardly been completed when he was invited to compete for the Brattle-Street Church, on the corner of Commonwealth Avenue and Clarendon Street in Boston, and his design for this gave him the first opportunity which he had ventured to use for the introduction of those original and striking motives which occurred to him so readily. Most of our readers know this church, which is in the Romanesque style which Mr. Richardson afterwards employed so nobly, and is adorned by a tower bearing a frieze sculptured with colossal figures. The novelty of the design pleased the judges, and it was adopted, and Mr. Richardson then, for the first time, felt his future secure enough to marry the young lady who had waited faithfully for him since he left this country for Paris.

WE need not detail the succession of brilliant works which followed the Brattle-Street Church. No doubt the best-known of Mr. Richardson's buildings is Trinity Church, in Boston, where a great opportunity was magnificently used. The reputation of this building brought him so many commissions in Boston, that before its completion he removed his family to Brookline, a suburb of Boston, where he has since lived, surrounded by the friends of his youth, for whom he cherished an unchanging attachment. Toward strangers, although he was uniformly kind and courteous to the hundreds of acquaintances which he made in his business, he felt no great attraction. So long as he could work at his beloved profession, with his family around him, he cared for nothing more. Partly, perhaps, through the influence of his long residence among the French students, and partly, also, through the effect of the dangerous and often distressing infirmity which harassed him for nearly thirty years, and interfered in many ways with his activity, Mr. Richardson's natural eagerness and enthusiasm had, during the years of his professional life, become concentrated into a passionate love of architectural art, which left little room in his thoughts for anything else besides his wife and children, to whom he was always tenderly devoted. It was this intense enthusiasm, more, perhaps, than anything else, which made Mr. Richardson's office so good a school for young men. To him his work was everything. He could talk well of a hundred other things, and did so when the occasion seemed to require it, but he had evidently not much heart in them, and was always glad to return to the one theme of which he was never tired, and from which no pain or fatigue could turn away his thoughts. It was impossible to be long near him without sharing to some extent in his enthusiasm, and the high ideal of

their work which so honorably distinguishes the younger generation of our architects is undoubtedly due in great part to the direct or indirect influence of his example. In his death American architecture suffers an incalculable bereavement. Few of us, perhaps, and least of all himself, have realized how conspicuous he was in the profession in this country, yet from Maine to Texas there is probably not an office in which Mr. Richardson's work, past and to come, was not an inexhaustible subject of discussion and source of inspiration. It will be harder than we think to accustom ourselves to go without this, but if we would do as he would wish to have us, let us, as the recollection of our loss recurs to us, resolve to emulate his courage and enthusiasm, and rejoice that his physical sufferings should to the end have been consoled by the affection which he cared for beyond all other things.

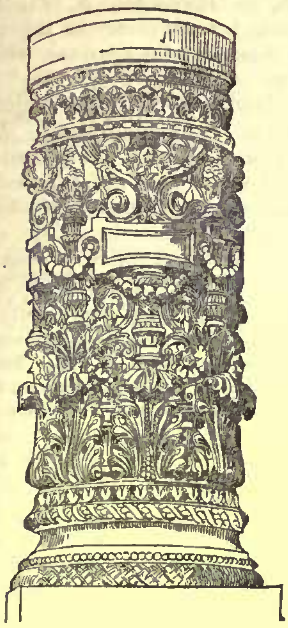
THE competition for the Rotch Scholarship in Massachusetts, held last month for the third time, has resulted in the selection of Mr. George B. Newton, of Brookline, as the beneficiary of the fund for the next two years. Mr. Blackall, the first holder of the scholarship, will return this summer, after two years of well-directed study. Mr. Mead, the scholar of last year, has still another year to enjoy the opportunity which the generosity of the Rotch heirs affords him; and Mr. Newton will find his way made easier for him, not only by the experience of the gentlemen who have preceded him, but by the favorable impression which their industry and intelligence has already made upon the persons on the other side of the ocean who are best able to assist such students in their work. Although the competition for the scholarship this year was confined to a small number of contestants, only three, we believe, having reached the final examination, the character of these seems to have been unusually high, and Mr. Newton has won his laurels from rivals well worthy of his steel. As usual, the examinations were conducted with scrupulous care, Professor Ware and Mr. J. Cleaveland Cady having been invited from New York to act, with Mr. W. P. P. Longfellow, of Boston, as judges of the competitive designs.

WE hardly know whether the profession of architecture or the tribe of the Philistines will feel the more highly honored at the selection by the Queen's Most Excellent Majesty of Sir Edmund Beckett, otherwise known as Mr. E. B. Denison, for elevation to the peerage of England. On the whole, the compliment seems to have been intended more particularly for the architects, the new peer being, according to his own account, a person of distinguished skill in their art, and we take pleasure in congratulating our British cousins upon the indication which the selection affords that the Upper House, instead of being recruited from the ranks of the beer-sellers and money-lenders, may hereafter occasionally, as was once usually the case, receive new members from among those professions in which the possession of a soul is considered necessary to success. We should have liked much to witness the solemnity of his lordship's installation. Perhaps the details of the ceremony have been changed of late years, and indeed, we suppose that the vow of courtesy to all men, which the candidate could hardly have taken without fatal results, must have been dispensed with on this occasion, but the spectacle of the proprietor of St. Albans keeping in white robes his vigil in the sanctuary must have been an edifying one. In his new sphere of usefulness we predict with sincere confidence a brilliant career for his lordship. Whatever may be his faults of training or temper, Sir Edmund Beckett is a very able man, and if he will turn that "eye for defects," which he considers the most valuable possession of one who has to supervise the construction of buildings, and which his remarks about other people show that he has cultivated to the utmost, to the contemplation of the British Constitution and the condition of his fellow-subjects, we may be sure that he will find some way to help in the amelioration of both.

THE fourteenth annual meeting of the American Public Health Association is to be held in Toronto, Canada, commencing on the fifth of next October, and continuing four days. The subjects discussed will be the Disposal of City Refuse, Water-Supply, the Teaching of Hygiene in Public Schools, the Suppression of Epidemics, the Sanitary Conditions and Necessities of School-houses and School Life, and the Preventable Causes of Disease, Injury and Death in American Manufactories and Workshops, and the Best Means and Appliances for Preventing and Avoiding them. Through the generosity of Mr. Henry Lomb, of Rochester, N. Y., the Association is enabled to offer prizes for essays on the last two subjects, as well as for plans for small dwelling-houses, which are also to form the theme of an important discussion. As most architects are more or less familiar with these subjects, the details of the competition will be found interesting. The whole fund which Mr. Lomb proposes to devote to the prizes amounts to seventeen hundred and fifty dollars, of which five hundred will be given for the best essay on the Sanitary Conditions and Necessities of School-houses and School Life, and five hundred for the best essay on the Preventable Causes of Disease, Injury and Death in American Manufactories and Workshops, and the Best Means and Appliances for Preventing and Avoiding them. The rest of the fund is divided into eight prizes of varying amount, two hundred dollars being offered for the best plan for a dwelling-house to cost, exclusive of cellar, not more than eight hundred dollars; while a second prize of one hundred dollars, a third of fifty, and a fourth prize of twenty-five dollars, will be given for the plans succeeding in order of merit. The other competition is for plans of a dwelling-house to cost not more than sixteen hundred dollars, including the cellar; and four prizes are offered of the same value as those for the plans of the cheaper house. Each house must provide accommodation for a family of five persons. The Committee of Award for the dwelling-house plans includes Dr. John S. Billings, Colonel George E. Waring, Jr., Dr. E. M. Hunt, Secretary of the New Jersey State Board of Health, Dr. J. H. Raymond of Brooklyn, N. Y., and Professor Charles N. Hewitt, Secretary of the Minnesota State Board of Health. The Committee of Award for the essay on the Sanitary Conditions of School-houses consists of Dr. E. M. Moore, President of the New York State Board of Health; Dr. Albert L. Gihon, Medical Director, United States Navy; Dr. Charles Smart, Surgeon in the United States Army; Professor C. A. Lindsley, Secretary of the Connecticut State Board of Health; and Dr. J. T. Reeve, Secretary of the Wisconsin State Board of Health. The Committee of Award for the essay on the Preventable Causes of Disease in American Manufactories consists of Dr. Granville P. Conn, President of the New Hampshire State Board of Health; Dr. Fallon, of the Massachusetts Board of Health, Lunacy and Charity; Dr. Stephen Smith, of New York; Mr. Crosby Gray, of Pittsburgh; and Dr. C. W. Chancellor, Secretary of the State Board of Health of Maryland. No stipulation is published as to the essays or the plans except that all intended for competition must be in the hands of the Secretary of the Association, Dr. Irving A. Watson, Concord, N. H., on or before August 15 next. Each essay or plan must have a motto, and must be accompanied by a sealed envelope containing the author's name and address, with his motto on the outside of the envelope. The awards will be announced at the meeting of the Association, in October.

A NOVEL system of transmission of force has been successfully put in operation in Paris, and seems likely to prove of considerable value in helping to solve the problem of the introduction of labor-saving machinery in small workshops. The agent employed in the new motor is air, but instead of being transmitted under compression, the machines at the central station pump out the air from the pipes which radiate to the various motors, and movement is obtained in these by opening a valve and admitting a portion of the surrounding atmosphere to supply the vacuum in the pipes. Although there does not seem, at first sight, to be much difference between this way of moving a machine and the old method of forcing air into the pipes and letting it escape through the motors, the system of exhaustion is found to have some practical advantages. In pipes used for conveying compressed air there is usually a certain amount of condensation of water from the vapor dissolved in the air, and it is necessary to carry this off by traps like those used for separating condensed water from steam; while the expansion of the compressed air in the motor is accompanied with an abstraction of heat from the surrounding matter, which sometimes freezes any condensed water which may have accumulated there, and is apt to give trouble by thickening the oil used for lubrication. None of these inconveniences are met with in the system by exhaustion, and the force provided is much more easily regulated than that of compressed air, the variations in which must be moderated by regulators before it can be made available for driving delicate machinery.

THE WORKINGMEN'S COLONY AT ESSEN, GERMANY.[1]



Shaft of Column in the grand foyer of the Grand Opera House, Paris

At the beginning of the present century Essen was a mere country village, too small to be noticed by any traveller, serving only as a centre for the agricultural inhabitants of the district to the northwest of Dusseldorf. The population amounted to about three thousand. At that time the immense coal deposits which underlie that whole section of the country were little appreciated, and but feebly worked in a few places. There were no industries of any description. In 1810, however, the Krupp Steel Works were organized, though on so small a scale and with so limited a practice that as late as 1848 the number of workmen amounted only to seventy-two. About this time the business passed into the hands of the second Friedrich Krupp, the present owner, and the establishment began the manufacture of cannon, which has since given it such a world-wide fame. The European wars of 1848 and 1856, our own war of the Rebellion, and especially the Franco-Prussian war were all so profitable to the Krupp works that by 1875 the number of hands employed had risen to 11,543. Indeed, looking over the record of the business transacted by the establishment during the past fifty years, one can easily see at what times the nations of Europe were at war with each other, for the immense extension given to the works in later years, and the extraordinary ability developed for turning out weapons of offensive warfare, combined with the untiring activity displayed in devising heavier cannon or more effective armaments, have made Herr Krupp a power in Europe with which nearly all the Governments have to do in case of war. The Krupp guns are found not only all over Europe, but also in China, Japan, the South American republics; in fact, in every country except those in which the English language is spoken. Great Britain and America do their own gun founding.

Herr Krupp has now in his employ, as actually listed on his books, very nearly 22,000 men, of which number 17,000 are daily employed in the central factory at Essen, while the rest are distributed in the various coal and iron mines in Germany and Spain, which are worked for the exclusive supply of the central establishment. It is easy to write 17,000, but it is hard to think of that number of men being under the direct employ of one person, and more difficult still to think of 22,000 men, with women and children representing a total population of not less than 75,000 souls, who look to the employment offered by the Krupp Steel Works for their daily bread. And even after one has had the rare privilege of visiting the works, and has seen the mighty engines in motion, the huge, roaring retorts vomiting steel all day long, the fifty-ton hammer condensing the steel blocks into gun-barrels, and the rolling-mills turning out steel rails by the mile; and has climbed into the muzzle of one of the 200-ton guns, and been told how many miles of telegraph-wire and railroad-track, how many locomotives and how many freight-cars, and — well, how many men are made use of within the carefully guarded enclosure of the vast establishment, the mind still fails to grasp the extent of it all, and one goes away wondering what would happen to these 75,000 souls and this expensive machinery if the works should be mismanaged or stop operations only for a few days.

The housing of so many workmen is quite a question. The city of Essen itself could not adequately provide for them, as the supply of dwellings did not keep pace with the growth of the number of inhabitants, the workingmen being crowded into uncomfortable tenements for which they were obliged to pay prices out of proportion to the accommodation afforded. Thus, while in 1820 the number of persons to each tenement in the city was only 6.39, in 1864 the average had risen to 15.30, or the equivalent of at least three families living in quarters intended for but one. It became, then, a necessity for Herr Krupp to provide for the growth he himself had brought to the city; and in 1860 the work was begun by the erection of two blocks of houses for the use of the office clerks and superintendents. During succeeding years other houses were built for the workmen as fast as the demand seemed to warrant their construction, until, in 1881, 18,698 souls were lodged in the houses erected by Herr Krupp, the total number at that time dependent upon the works for support being 65,381. Official reports since that date are not to be had, but as nearly as could be ascertained, there are now in all 3,170 tenements occupied by employés of the works.

[1] It may be of interest to state that this article, judging from the time it reached us and its moist and blurred condition, probably just escaped the fate that attended so large a part of the unfortunate "*Oregon's*" mails. By a happy conjuncture the illustration, which, if it had been sent by the same mail, would probably have been sent with the newspaper mail in another bag and so, probably, lost, was not quite finished, and was sent to us safely by a later steamship.

The houses are arranged in colonies grouped as near the entrance to the works as circumstances would permit. The largest of the colonies has 1,248 tenements; the rest are much smaller, there being seven in all. These colonies belong wholly and entirely to Herr Krupp — land, streets, houses, gas and water supplies, stores, all are in his name, and he even provides police and fire departments, the city having no rights over the districts any further than that they form a part of the commune and are taxed accordingly. In this way Herr Krupp has entire control over his workingmen's houses, and can manage them as he sees fit.

The large number of workmen to be accommodated, and the high cost of land, as well as a desire not to have the colonies extend too far away from the works, decided Herr Krupp not to adopt the cottage system for his houses. Consequently all the colonies are built up in blocks of from three to ten houses, mostly three stories high. The construction is essentially the same throughout. The walls are of common brick. Under each house is a clean, dry cellar, 2 m. 10 high, used only for storage of fuel, each tenement being allotted its share of space. The floors are of wood, the interior walls are plastered and painted in oil colors, the stairs are of stone, the roofs are covered with tiles. There are no open fireplaces, but in general each tenement has two rooms which are provided with a flue. There is one water-closet for every two flats. The first and second stories are from 2 m. 94 to 3 m. 18 high in the clear, and the third story 2 m. 55 to 3 metres. Some of the earlier houses were made with lower stories, but the larger dimensions seem to be preferred. The houses are mostly arranged with tenements of two and three rooms each, all the rooms being of about the same size, and averaging approximately 165 square feet in area. Comparatively very few houses are arranged with four and five rooms to the tenement, none of these being in very great demand.

Water-mains are laid in all of the streets, with hydrants at each corner from which the tenants of the houses draw as needed for their use, there being no supply of water to the houses. The streets and all hallways, as well as a few of the larger tenements, are lighted with gas. None of the colonies are provided with sewers, all of the waste being collected in tight cesspools, which are emptied at stated intervals. The entire water, gas and sewage removal plant has been installed by and remains in the possession of Herr Krupp.

No one type has been followed in planning the houses, nor does any plan appear to have been evolved which has been adopted as perfect in all its details; but the one which is repeated the most often is that used in the Kronenberg colony, Fig. 2. [*See Illustrations.*] In this, each family has but two rooms. The water-closets are on each side of the front door, an unpleasant feature which is repeated in nearly every colony. Another scheme used in the same district is shown by Figure 2, each flat in this case having three rooms, the entrance being at the side, and there being but two houses in a block; a much better arrangement in some respects, though not as much sought after, the workmen generally preferring to crowd themselves and families into two rooms rather than pay extra for more accommodation. The Kronenberg colony is not only the largest but also the most pleasantly situated and of the most recent construction. The blocks of houses are built far enough apart to allow space for each family to have a little plot of ground which may be cultivated as desired, besides which each house has allotted to it a grass-plot about thirty feet square, which the individual families utilize successively for drying clothes. In the centre of the colony is an extensive market-place where, under certain restrictions, the country people can sell their produce to the workmen, and where village fairs are held from time to time. As to the houses themselves, they are well built and kept in good order and answer every purpose of housing the people, but they are far from pleasant in appearance. They are plain, inexpensive barracks — hardly more; and no one could possibly conjure a home out of the forlorn, dull red structures which repeat themselves block after block with such monotonous sameness. It is a hard task, perhaps, to suit 75,000 working people, and the laborers are undoubtedly much better housed than they could possibly be if Herr Krupp had not undertaken the work; but it costs so little more to make the houses attractive that one cannot help wishing for a little less comfort, perhaps, and more individuality.

But if the Kronenberg colony is plain and tasteless, the adjoining colony of Schederhof is a hundred-fold worse. Figures 3 and 4 give the two types of plans, which of themselves are not at all bad; indeed, Figure 3 is better than the plans previously considered in that the water-closet arrangements are more private. But gloomier, more forlorn-looking streets could hardly be imagined than are made by the rows of these houses, all in dark, smokey brick, no yards, no trees, no sidewalks even, no grass plots, nothing but these gloomy, three-story structures, reaching from street to street, and as repulsive as a prison or a tobacco factory. This colony has never been extended, fortunately, for the workmen who might have to live therein, and has never been imitated elsewhere.

For the houses themselves, the Drei Linden colony is the most pleasing. Figures 5, 6, and 7 give the three types of plan. The houses here are all two stories high, and by arrangement of wings, roofs and recessed balconies an attempt is made at a little individuality. There are but two houses in a block, and each block, or house, for each has the appearance of a single house, is set back from the street and surrounded by a garden, giving a rather pretty effect to the entire colony. Indeed, these are the only houses that have anything like a *home* look, the only ones that would not answer just as

well for stables or barracks; but for some reason the Drei Linden colony is quite small and none of its types have been used in subsequent construction elsewhere. The colony is about three-quarters of a mile from the works, and somewhat out from the city, and the land being cheaper it was not essential that the tenants should be concentrated into three-story houses.

Figure 8 shows the plan adopted for the houses intended for the use of the clerks and superintendents, there being four and six houses in a block, of three stories in height. The plan shows an upper story. The entrance is in the front under the room marked A, this room being connected with the tenements on either side of the hall, and rented with one or the other as desired, thus allowing for suits of four and five rooms each. The water-closets open from off the stair-landing.

Besides the houses divided into tenements Herr Krupp has erected five large buildings which are designated by the doleful name of the Bachelors' Barracks, where single rooms are rented to unmarried men. There are four *Kasernen* accommodating one hundred and twelve men each, and one monster building immediately adjoining the rear entrance to the works, which can receive twelve hundred tenants. As nearly as could be ascertained all of the occupants are obliged to provide their own furniture, though the care of the rooms is in the hands of a janitor. There are also a number of houses known as *Barackenwohnung*, divided into tenements of two rooms each, but without cellar accommodation or any garden or grass-plot privileges.

The rents of the tenements vary from 60 to 1200 marks per year, being 60 to 90 marks for two rooms in a *Barackenwohnung*, 90 to 108 marks for two rooms with cellar, etc., 120 to 162 marks for three rooms and cellar, 180 marks for four rooms and 210 marks for five rooms. The average price for the workingmen's tenements is about 108 marks, or $27 per year. The rent of the houses for clerks and superintendents runs from 180 to 1200 marks per year, with an average of 250 marks, or $62.50. As previously stated, none of the houses are sold under any conditions whatever, nor are leases granted for more than a year. The rent is collected from the wages of the men every two weeks. It should be stated that the tenements are rented only to employés of the Krupp works. There are several other manufacturing establishments in Essen, but the workmen in all of them are obliged to find quarters in the city.

Herr Krupp has not stopped his work at merely providing shelter for his hands, but he likewise furnishes them at nearly cost price, every article that is required for home consumption, including furniture and cooking utensils, coal, oil, groceries, bread, meats, liquors, clothing of every description, sewing-machines, books and periodicals, and even articles of luxury and personal adornment. At a central point is established a large magazine where all articles are kept in bulk as well as sold over the counter. The quality of the goods is the best the market affords; indeed, as these stores sell to outsiders as well as to those who are employed in the works, the people of Essen buy here in preference to patronizing the smaller dealers of the city; and the result is that Herr Krupp completely controls the prices of the goods, and has it in his power to ruin the trade of the small dealers if he chooses. That he sells the goods at a profit is proved, however, by the fact that the small dealers continue to thrive. The profits of the sales are used exclusively for the benefit of the workmen, directly or indirectly. Besides the central establishment, there are in each colony a number of what we would term grocery stores, which bring the produce directly to the doors of the consumers. All the sales are for cash.

In each colony restaurants are also established for the exclusive benefit of the Krupp workmen, where meals are served at so low a price that a man is amply provided for at one mark ten a day.

Space would fail to notice in detail all of the establishments created and controlled by Herr Krupp in connection with his workingmen's colonies. In each district there are schools where the children receive a good elementary education. In one of the colonies is a large grammar school, sustained and directed by the commune, though built and endowed by Herr Krupp. There are large hospitals, too, where the sick receive the best of care; and on the outskirts of the workingmen's quarter are isolating wards for contagious diseases. There are asylums for the aged and infirm, who have served over a certain time in the works, and insurance funds for the benefit of those who are killed by accident. A free medical service is established under certain restrictions, and large bathing-houses offer plain baths at four cents each, and vapor baths at one mark. Herr Krupp treats his men very fairly; better than would be expected when so many thousands are employed. After educating the children, the most promising are received as apprentices, and a limited number of those who show special aptitude are sent to an engineering school at the expense of the establishment. The hours of work are long and the pay small as compared with American standards, but that the men are satisfied is shown by the fact that there have never been any strikes or labor troubles of any sort. Of the total number of workmen, forty-nine per cent have been in the employ of Herr Krupp from one to five years; thirty-three per cent from five to fifteen years; and eighteen per cent from fifteen to thirty-five years; a pretty good showing, and one which speaks well for the relations between employer and employed.

The inhabitants of the colonies are quite as free from burdensome regulations as tenants in any city. All repairs are attended to by Herr Krupp, but the people are quite at liberty to fix-up their rooms, within reasonable limits, and though the terms run only by the year, no one is evicted unless he notoriously misbehaves himself, or fails to pay his rent. There is one institution in connection with the colonies, however, which seems rather strange from an Anglo-Saxon standpoint: namely, the establishment of liquor-saloons, or more properly beer-gardens, likewise the property of Herr Krupp, where the workmen can obtain all the good beer or spirits they want to drink, or to take home with them. Such a feature would be disastrous to the last degree in England or America, but the Germans do not seem to be troubled by it; at least there is no drunkenness reported in the colonies, though it is not lacking in the City of Essen itself.

It may be of interest to compare this German attempt at caring for the working classes, with what has been done under French influence at Mülhausen, and by Italians at Schio. Signor Rossi's colony in the latter city is certainly by far the most pleasing in appearance, and much more is done there to thoroughly educate the workmen and give them comfortable surroundings, than in either Essen or Mülhausen. But at Mülhausen each man is his own master, and the conditions of sale and ownership of property tend to develop individuality and self-reliance, which while perhaps inexpedient under all conditions, certainly work very successfully among the Alsatians. Considered simply as workingmen's colonies, Herr Krupp's establishments are by all odds the least satisfactory. The houses are well built but uninviting and barrack-like to a painful degree; hardly better than our own tenement-houses of the east side of New York; while the individual seems to be ignored, and the man is only one of 20,000, with everything about him, land, house, almost his clothing and food, held by the central ruling hand. The workmen are herded together in a manner which while doubtless a necessary consequence of their immense numbers, must be none the less uncomfortable to one who aspires to a home of his own. It is doubtful if any one would take a special pride in announcing himself as a resident of the Schederhof Colony, for instance, and we can hardly believe that any son of Herr Krupp would be contented to build him a house and live right in the midst of the workmen, as Signor Rossi's son has done at Schio. Herr Krupp has simply recognized the absolute necessity of providing for his workmen, who but for his care, would be undoubtedly a hundredfold worse off than they are. That he has met the necessity in a manner as economical as possible of land, material and money is no discredit to his benevolence, and whatever may be said comparatively the colonies at Essen and their adjoined institutions are deserving of high praise. Not every wealthy manufacturer would do what Herr Krupp has done, even were the necessity as great.

C. H. Blackall.

To Mr. Blackall's letter we add a few extracts from an article by Mr. Edmund Hudson, published December 2, 1883, in the Boston *Herald*, and reprinted later by the War Department as "*Ordnance Note*, 328."

Mr. Krupp's system of administration is itself a fit subject for careful study. He is the sole owner of the great works which bear his name, but they are so organized and governed by his assistants, that he is left free to give as much attention as he pleases to scientific questions appertaining to the manufacture of steel, to new inventions, and especially to the construction of heavy guns. To attain this result he organized what is legally entitled the "Firma Fried Krupp," which is composed of himself, his son, and seven or eight gentlemen of the first order of ability, who are paid large salaries. Herr Krupp spends his time almost entirely at his residence, the villa Hügel. There he receives the members of the firm and the visitors who come to him from abroad. He need not visit his works for months together unless he chooses. His assistants carry on the vast business as if they were actual partners, and trouble him only with the things that he needs to know. Contracts are made and a great many important things are done which never receive his attention at all, because they do not require it. The employed members of the "firma" consist of gentlemen who have had experience in affairs before entering the service of Mr. Krupp. Several of them have been in the civil service of some of the German States. Each one has a special department of duties. Thus Mr. Cohnheim is a merchant; Mr. Erhardt, a special mining engineer; Mr. Gussmann, administrative employer; Mr. Yencke, administrative employer; Mr. Klüssel, lawyer; Mr. Longsdon, engineer; and Mr. Fritz A. Krupp, engineer. These gentlemen have their offices together in a plain building, centrally located in the works at Essen. They meet in a large room like a President's cabinet, minus the President, or an editorial consultation in the office of a leading newspaper. There is a vast correspondence, which is opened by one person and distributed among the various members of the firm and their assistants for consideration and reply. For every important communication relating to the business of Krupp, the signatures of at least two members of the firm are required. One of the signatures is necessarily that of the member who knows all about the matter in hand. The other signature may be merely formal. Thus it happens that persons or governments carrying on a correspondence with the establishment at Essen may find the signatures to their letters constantly varying, and I was told that not long ago the Danish Government made a special inquiry to ascertain how it happened that their letters from Essen were signed by so many different persons. The members of the firm above named are a sort of central bureau or cabinet, who are assisted by some three hundred clerks or draughtsmen, and this force constitutes the brains of the establishment. All the rest is merely the direction of labor, which is carried on by the foremen of the various shops and departments, as in other establishments. . . .

Here are a few statistics of the cast-steel works at Essen: Number of furnaces of all descriptions, 1,542; steam-boilers, 439; steam-engines,

450, with a total power of 18,500 horses; steam-hammers, 82; machines for working steel and iron, 1,622; railway-tracks of normal gauge, in length, 44 kilometres, with 14 locomotives and 539 cars; narrow-gauge railways, 26 kilometres, with 14 locomotives and 344 cars, 65 horses and 191 drays; 65 kilometres of telegraph-wire, with 35 stations and 55 Morse instruments. Among the most important buildings are the crucible-steel melting shops, puddled-steel shops, Bessemer-steel works (15 Bessemer retorts), Siemens-Martin-steel works, the great steam-hammer, steel-rail mill, steel-tire mill, plate-mill for iron and steel plates up to three yards in width, iron foundry for machine casting and for projectiles, containing eight cupola-furnaces, shops for the construction of locomotive and wagon wheels and bridge and girder work, spring-steel rolling-mill and spring shop, the vast gun-shops, etc. In the works are a chemical laboratory, a photographic and lithographic department, a printing-office with three steam-presses, and a book-bindery. The daily consumption of coal and coke is over 3,100 tons, of which 1,400 tons are used in the blast furnaces and steam-engines at Essen. . . .

The product of the works at Essen averaged is 1,000 tons of steel per day for each working-day of the year. Steel cannon, steel rails, steel car-wheels, steel shafts for steamships, all steel parts of locomotives, steel springs — these are the principal forms in which the metal goes forth to Krupp's agents and customers in every part of the world. The locomotive-supply business is an enormous department of the works. Krupp supplies the locomotive workers with every component part of the complete machine, but makes no locomotives himself. . . . One of the most interesting processes is the evolution of car-tire from a solid block of steel, which, by the use of the hammer and subordinate machinery, is expanded, until a ring of the proper diameter and circumference is formed without a weld. . . .

There is no more brilliant spectacle this side of the infernal regions than the casting of a huge block of crucible steel. This takes place at Essen three times each day. The crucible works are covered by a vast building open at the sides — simply a vast roof covering several acres of ground. All this space is required because the steel, which goes into the great mould, is melted in small crucibles, no one containing more than 80 pounds. These crucibles are carefully filled with bits of new soft iron, steel shavings, etc., in combinations which vary according as the metal is to go into cannon or crank-shafts or other forgings. These crucibles are placed in furnaces just below the surface of the ground and left covered in the heat for eight hours. During this time only a sufficient number of men is required to fill and deposit the crucibles in the furnaces, keep up the fires, which are fed from long underground corridors, and to prepare the mould, which is placed as near as may be in the center of the works. But at the appointed hour the scene changes from comparative stillness to remarkable activity. Men flock in by hundreds from every part of the works — for the largest castings 1,200 men are required to handle the crucibles. On the day of my visit there were only 400 men, but twice the number would not have made the scene a grander one. At a given signal the 400 leaped to their work. The long lines of furnaces were uncovered in a twinkling, and the men, with arms and hands covered, rushed to the brink of the seething fires and began to draw the crucibles. Three men lift each crucible from the white depths of heat, and then two others seize it with long steel clamps and run toward the troughs, through which the metal is made to flow into the mould, which is, like the furnaces, wholly under ground. The men strike the slag from the tops of the crucibles as they run, opening up the orifice at the top of each one for the pure metal to come out. There must never be any cessation in the flow of the metal until the last crucible is emptied; if there were, the whole would be spoiled. So the men shout, and hurry, and run, the sparks fly in every direction, and the black earth that we stand on seems to be taking fire. The heat around the troughs is something dreadful, and the men shout for pain, as well as excitement, as they rush back and forth with the gleaming crucibles suspended between them. When the last crucible is emptied the excitement suddenly ends, and the men rapidly disperse, but not until they have been given a drink of brandy, which is needed to offset the tremendous physical strain of the half hour which they spend in handling the crucibles. . . .

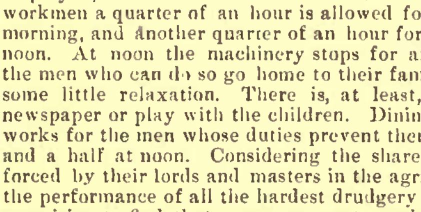
The fabrication of cannon is the matter of chief personal interest to Herr Krupp, who watches with the closest interest what governments in every part of the world are doing and proposing to do, relative to their armaments. Nearly every government, except England and the United States, has been a purchaser of Krupp guns, and there seems to be no cessation in the demand for them. . . . Krupp's preëminence as a gun-maker is unquestionably due to his early perception of the fact that steel must supplant iron in the fabrication of ordnance, and to his possession of such unrivalled facilities for the manufacture of steel in his own works. New ideas in the construction of ordnance I do not understand that Herr Krupp claims to have developed, but he was one of the first to perceive that breech-loading cannon would completely take the place of muzzle-loaders. It was this change which definitely forced the abandonment of iron in the construction of cannon in Europe. Krupp satisfied himself that the wedge-system of breech-closing was the best, and in spite of the conclusion of the French and English authorities that the French interlocking-system is superior, Krupp goes ahead, and shows no sign of giving up the system with which his name has come to be identified. . . . Every gun is tested on the grounds near the shops by being fired four times, and the large guns are then sent to Meppen, in North Germany, to be tested by the agents of the governments which purchase them, if such tests be desired. . . . The trials at Meppen are all for the purpose of testing the range of the gun — those at the works to test the strength of the gun. . . .

The system of apprenticeship at the works has received a good deal of attention from Krupp's managers, but has not yet taken on the proportions which it might be expected to fill. The term of apprenticeship is four years, and in 1882 there were 38 young men who completed it. A large proportion of the young men in Essen go into Krupp's service without any special course of training, the work which they perform not requiring it. The apprentices are all required to attend the "*Fortbildungschule*" in Essen, where they are taught drawing and a good deal of theoretical knowledge concerning mechanics. Their pay during the first year is from 15 to 20 cents a day, which is increased to 2 1-2 marks, or about 62 cents in the last year. Half of this is retained by the firm, and the thirty-eight young men who came out last year were paid an average of 677 marks, or about $130 each on the expirations of their terms of service. Comparatively small as is the number of apprentices, it is a fact that many of Krupp's most valuable and skilled workmen have been taught and developed in his own works since 1864, when the system of apprenticeship was begun. . . .

There is a regularly-organized fire department, consisting of 63 persons. There is a central station, with which 49 other stations are in electric connection, 20 inside, and 29 outside of the buildings. The men are organized in seven different squads. They are regularly instructed, and have a uniform. With such a system a large fire in Essen is an impossibility. There has been in 17 years but one large fire in the steel works, which occurred in 1871. Records are kept of 13 smaller conflagrations and 345 very small outbreaks of fire which have occurred in the same period. Thus Krupp, with these enormous works so crowded together as to furnish a very inviting field for the fiery element, has never been a serious loser from fire, and is wholly relieved from all expense of insurance, which forms so important an element in the American manufacturer's balance-sheet. . . . The firemen work in conjunction with about 200 watchmen, whose duty it is to give alarm in case of a fire breaking out. Of course the hydrants cannot be located at every exposed point over so vast a territory, and there are eight two-wheel fire-engines, which can be moved about with the aid of a horse, and which may be called upon should a fire break out in any part of Essen. There are 29 ladder-stations within the works. The unmarried firemen are furnished with free lodgings at the central station, which is located as near as possible in the centre of the works, and the married men are furnished with dwellings as near as possible. There are 300 hydrants and 400 fire-cocks connected with the high-pressure service alone. . . .

Herr Krupp has discounted the communist movement by establishing a practical communism, which may well be studied by other manufacturers who wish to organize a successful business and to avoid all difficulties on the wage-question. His men know that on his ability to keep his furnaces and mills going when others may be idle or losing money, depends their assurance of steady employment, and American manufacturers who are disposed to complain because a similar spirit does not exist in the United States, will do well to stop and inquire whether, after all, they have done as much for their employés as Krupp is doing for his. Yet the hours in the cast-steel works are very long. The men all go to work at six o'clock in the morning all the year round. Those who work at the furnaces and mills go off at six in the evening, and the others at seven. In many of the departments a night-force is employed, in order to utilize the heat of the furnaces. For day-workmen a quarter of an hour is allowed for breakfast at eight in the morning, and another quarter of an hour for coffee at four in the afternoon. At noon the machinery stops for an hour and a half, and all the men who can do so go home to their families for a good dinner and some little relaxation. There is, at least, half an hour to read a newspaper or play with the children. Dining-halls are provided in the works for the men whose duties prevent them from taking the full hour and a half at noon. Considering the share which German women are forced by their lords and masters in the agricultural regions to take in the performance of all the hardest drudgery on the soil, it seems rather surprising to find that women are not employed in any department of the cast-steel works. The men look strong and well. Three thousand of them are liable to be called out of the works and mines for military service in time of war. Herr Krupp being a valuable military ally for the goveroment, however, he is allowed at the beginning of each year to designate to the government 500 to 600 of the men of the military age whom it would be essential to retain in case of a war, and thus the government guards against inflicting any embarrassment at the time when it might have the greatest need of utilizing his establishment. . . . The young men who go into the army come back much benefited in health and character by the service which they do there, and they are more valuable workmen afterward than they would be if they had no knowledge of military life. There is one significant difference between Essen and any American manufacturing town where men have regular employment — the apparent absence of much necessity for savings banks. It is a fact, however, that a savings establishment has recently been found necessary, and in future years it may, doubtless, have a more prominent place in the annals of Essen than it now possesses.

AMERICAN ARCHITECTURE AS SEEN BY THE FRENCH.



Vignette by Edelinck,

THE last issue of the *Moniteur des Architectes* contains reproductions of the sketches of Mr. Richardson's library at Malden, Mass., and of a safe-deposit building at Baltimore by Messrs. Wyatt & Sperry, both of which were first published in the *American Architect*, and as we have lately read of the growing esteem in which American architecture is held in England, it will be interesting to learn how French architects régard our work. We therefore translate M. Boussard's remarks at length:

"American architecture is exceedingly interesting to study in its manifold transformations; borrowing as it does from every style, from every form, from every epoch, its monuments are curiously instructive. A nation hardly formed, since it has not yet closed its

first century, tradition has not founded for it what we in the older countries of Europe style a 'school.' With us, in fact, all things form object lessons — houses and monuments, by contact with which the artistic perceptions of our children are developed and prepared for the instruction of 'the school.' In America, on the other hand, the new-founded city offers nothing for the meditation of the future artist, and for instruction in the precepts of the schools one has to seek abroad the traditions which the mother country does not furnish. Look at this library, for instance, and let us try to trace the origin of this structure, so antique of air and yet so newly built. Surely its architect has seen our European libraries, and one of them has impressed itself on his imagination by the grandeur of its style. Is it a library of our own epoch with which he has been smitten? Evidently not, for the *régime* of art of 1830, under which we still live, has always had for its end and aim the suppression of style: within, antique furniture and tapestries have been stored in attics to make way for the ready-made cabinets and so on, and the square house with green blinds has thrust aside the little Louis XVI *hôtels*. That which has impressed this American architect is the air of one of our libraries established midst the ruins of some old convent, of which the semblance is here presented. The cloister, more or less complete, serves as the court of honor, and also as a gallery of sculpture, fragments of which have been let into the walls of the portico. The principal staircase, enclosed in a projecting tower, detaches itself from the façade of the main building, against which the cloister gallery butts: one enters the building by a low door at the foot of these stairs. In the interior are vast halls, vaulted or ceiled with wooden ceilings, where are established the museum on the ground floor, and the library on the floor above it. We all know the kind of monument which with us simply indicates the utilization of some fragments of our past glories. The American architect, fortifying himself by our present practices, has construed our fragmentary work as indicating a principle, and builds a new monument according to the rules of this old conventual art. Was he right? Was he wrong? The question is worth considering.

"Conventual architecture, one cannot say it too often, is an adaptation of Roman architecture to the needs of our climate, and the greater part of its rules of construction are excellent. But it is also an adaptation made with the needs of conventual life kept clearly in view, and which must be eliminated in modern use. In fact, in our rainy climate, we need another form of portico than the Roman one which gives shelter only from the vertical rays of the sun, and the low and wide gallery of the French cloisters is an excellent typical modification. Next come the rooms of width and height enough to ensure abundant air for those who remain in them, and whose decoration and furnishing are suited to rooms in which climatic necessities compel the inhabitants to shut themselves at times.

"To apply these grand laws calls for great intelligence on the part of the American architect, it being understood that the climate of America is still more rigorous than ours, and that he is surely more wise than those of us who regulate their conceptions by the prevailing mode. But where this American architect sins is when his adaptation becomes a servile copy. In fact if the main façade, with its fragment of cloistral gallery, including also the stair turret, is more or less adapted to the purpose as exterior decoration, all the rest of the building is of a rustic, almost dilapidated, nudity, which is positively condemnable. The bare and miserable exteriors of our convents were a necessity of the times, in the first place, because no care was or ought to be given to outside decoration, and next, for analogous reasons, it was dangerous to call attention to the wealth and luxury within. With these exceptions, the conception of this library is an exceedingly interesting work to study."

Of the design for the building of the Mercantile Trust and Deposit Company, which we published on May 29th, 1885, M. Boussard exclaims:

"*Encore les Américains!* — True enough, but see how their architects work! These men have aimed at largeness, and they have succeeded perfectly. We can cavil at certain details of the façade through consideration for the harmony of style, but we must doff our hats to the result as a whole. This is indeed a place of deposit for commercial valuables, in which aspect of security is of as much real importance as the actual security. Apropos of this the plan is a most curious study. *Chers confrères.* Here is art well understood! Let us imitate in this Messrs. Wyatt & Sperry."

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

PUBLIC LIBRARY, WOBURN, MASS. MESSRS. GAMBRILL & RICHARDSON, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

IT may be in some slight degree instructive to turn from this print to the reproduction of the original design published in our issue for March 3, 1877.

PUMPING-STATION AT CLEAR STREAM, L. I. MR. A. D. F. HAMLIN, ARCHITECT, N. Y.

The Clear Stream pumping-station is one of four stations erected within three years to furnish Brooklyn with an auxiliary water-supply derived from gangs of driven-wells, which tap the remarkable underground stream of pure water which seems to traverse the western end of Long Island. The novelty, simplicity, and boldness of the system as here applied, have attracted much attention, and its phenomenal success has surpassed expectation, far exceeding the guaranty required by the city from Andrews & Company, of New York, the owners of the patents for this system, as a condition of its acceptance of the plant from their hands. At the Clear Stream station the wells number one hundred and fifty-two, arranged in two rows eighteen feet apart. The wells are of two-inch tubing eighteen feet apart in each row, connected by three-inch pipes with the great sixteen-inch collecting-main which lies between the two rows of wells and which is interrupted at its middle point by the receiver, from which start the suction-mains of the double pumping engines. The latter deliver the water into the city supply-main, which is not one hundred yards distant. Each well taps no water-bearing stratum at less than fifteen feet from the surface, but penetrates forty feet farther into the sand, and can be disconnected from the collector by a cut-off valve. It is thus seen that the system is very simple in theory. Its remarkable success in the Brooklyn stations is due largely to the perfection of the plant, and the extreme care and ingenuity bestowed upon its smallest details. The engines, which, in the stations at Clear Stream and Connselya's, are of the compound, duplex, condensing, fly-wheel type, were all built by the Knowles Company, and at each of the two latter stations have delivered fourteen million gallons *per diem* for considerable periods, ten millions being the amount guaranteed. For descriptions of the engines see the *Scientific American* of April 10.

The Clear Stream station is built of brick, faced with Croton brown brick, and with pressed and moulded brick trimmings. The woodwork is of oak, except the roof. This is carried by Georgia-pine trusses, with iron tie-rods, and is ceiled with white pine, and slated externally with Maine slates. The engines are placed as near the level of the water as possible, and are reached by steps from the boiler-room and platforms. The walls are painted internally a delicate salmon-color, relieved by bands of dark red at the level of the spring of the window arches, and by a wainscoting of enamelled brick up to the level of the window-sills, while the ceiling is of a shade of turquoise-blue between the trusses, which are varnished. The interior of the engine-room, with the handsome finish of the engines, is thus unusually agreeable in effect. It is abundantly ventilated by the dormers and gables, which were introduced into the design to avoid the necessity of an ugly "monitor top" over the roof. The whole building, with the engines, stands upon a heavy bed of concrete. The masonry and roof were built by day labor; the interior finish in oak is by Mead & Taft, of Cornwall, New York; the engines by the Knowles Company of New York; the well-plant by Andrews & Company, and the brass-work by the American Art Metal Works of New York. The cost of the building alone was about $9,000 to $10,000.

BAPTIST CHURCH, CORNING, N. Y. MESSRS. PIERCE & DOCKSTADER, ARCHITECTS, ELMIRA, N. Y.

THE church is of brick with Ohio sandstone sills, caps, etc. The basement has kitchen, pantry, dining-room and water-closets; the first floor has two parlors, robing-rooms, study, library, vestibules and audience-room, with seating capacity for four hundred and fifty. The second floor has two social rooms and library. The main social rooms, three in number, open directly in front of the rostrum, so that about three hundred sittings can be made available if desired. Smead-Ruttan system of heating and ventilating is used. Messrs. Allington & Sons, of Elmira, N. Y., have the contract for erection, and have the building inclosed. Cost complete about $18,000.

TOWN-HALL, PROVINCETOWN, MASS. MR. J. A. FOX, ARCHITECT, BOSTON, MASS.

THIS building is of wood, and is now in progress. The town offices are on the ground floor, and a public hall on the second floor.

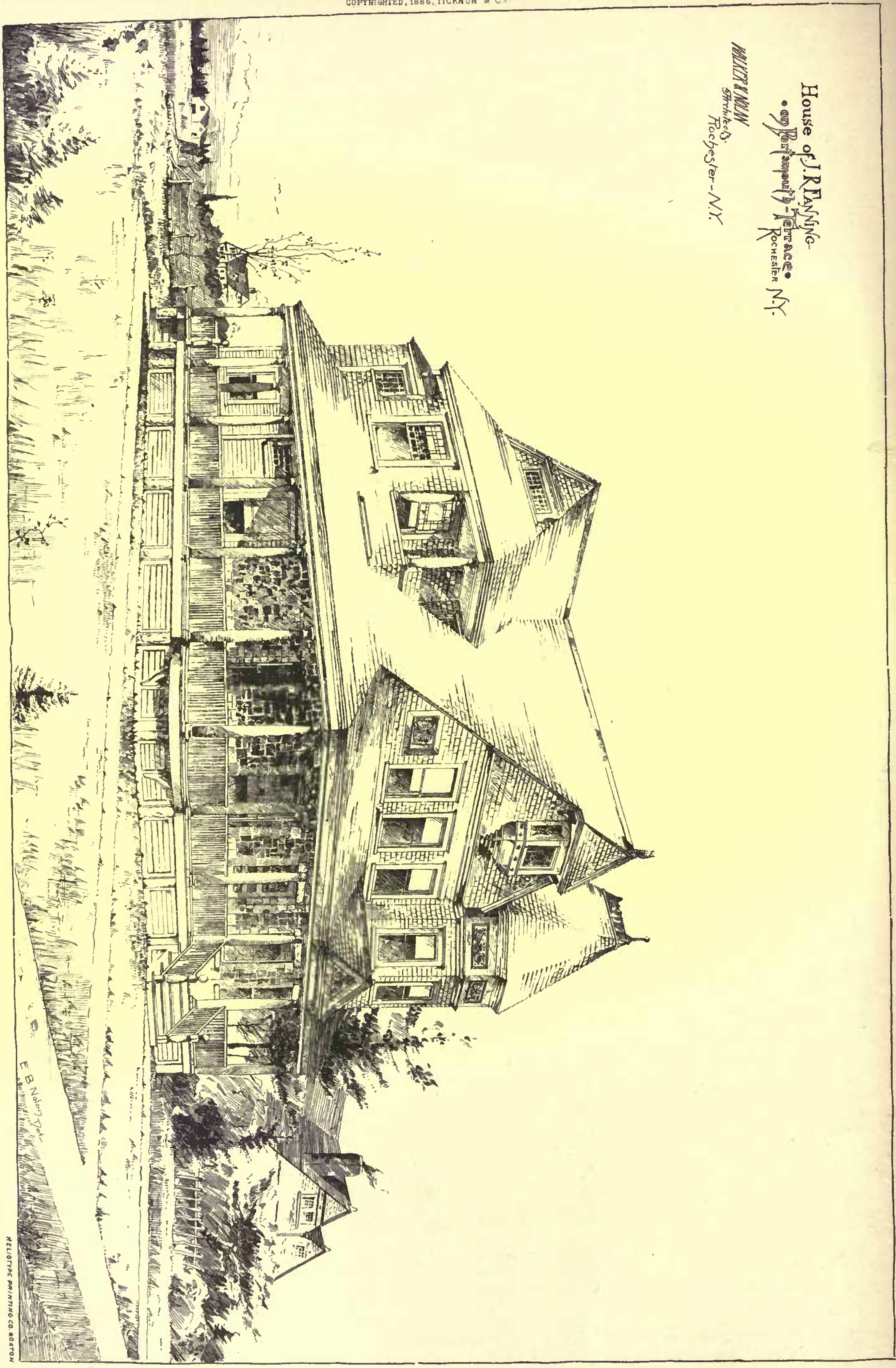
WORKMEN'S HOUSES AT THE KRUPP STEEL WORKS, ESSEN, GERMANY. DRAWN BY MR. C. H. BLACKALL.

For description see article elsewhere in this issue.

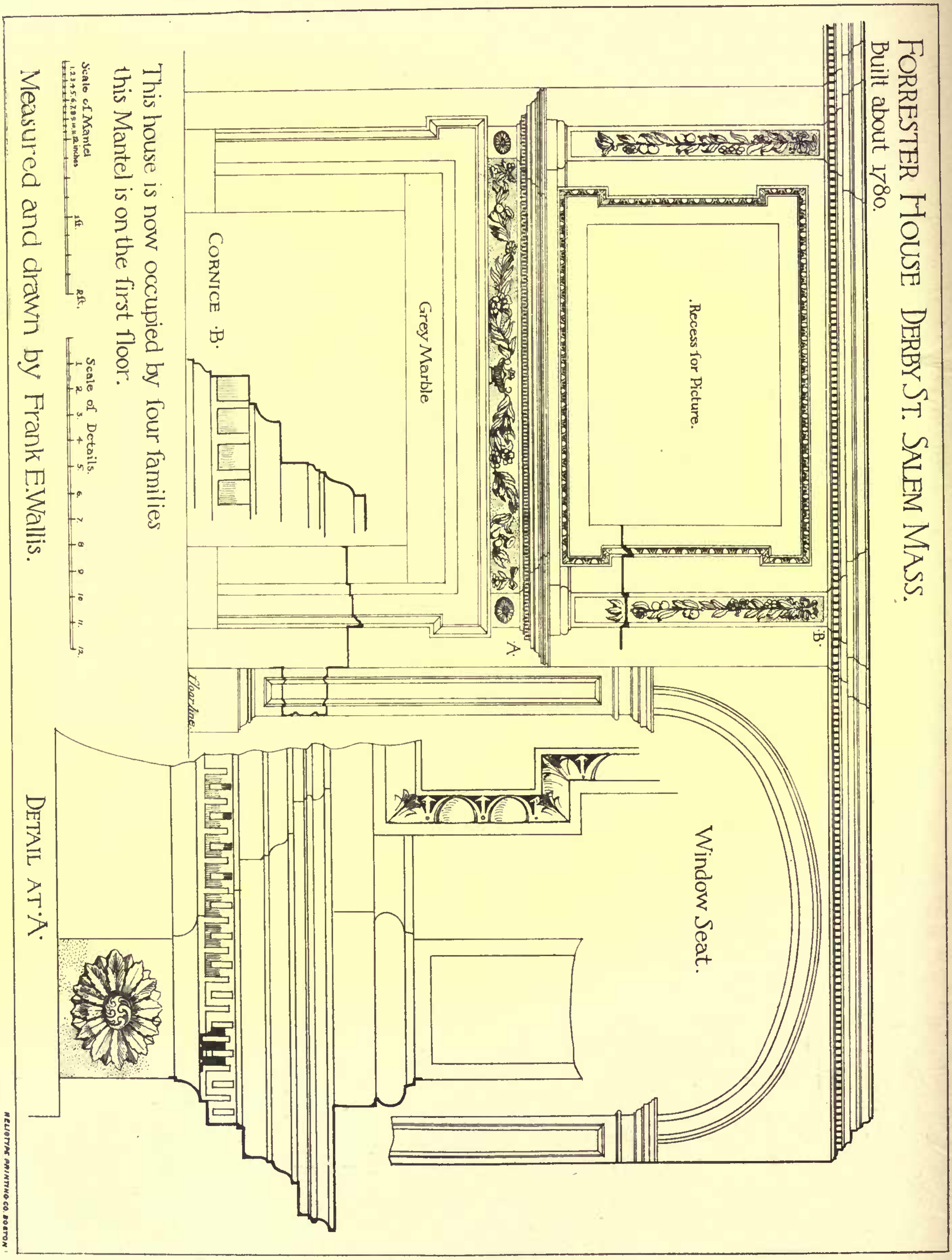
OLD COLONIAL WORK. NO. VI, A MANTEL IN THE FORSTER HOUSE; NO. VII, A WINDOW IN THE PHILLIPS HOUSE, SALEM, MASS., MEASURED AND DRAWN BY FRANK E. WALLIS, BOSTON, MASS.

HOUSE OF J. R. FANNING, ESQ., ROCHESTER, N. Y. MESSRS. WALKER & NOLAN, ARCHITECTS, ROCHESTER, N. Y.

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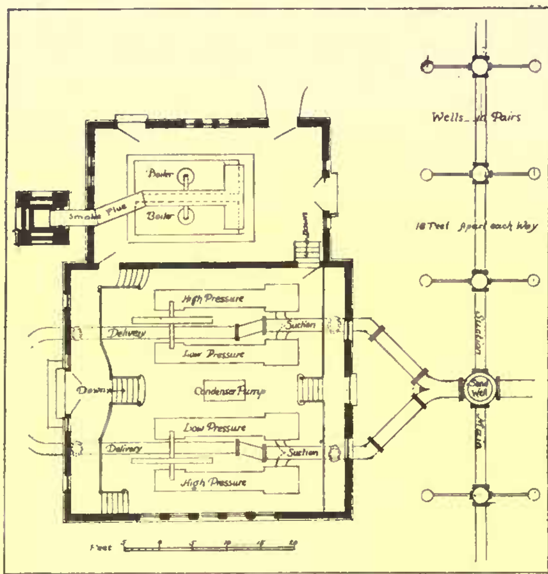
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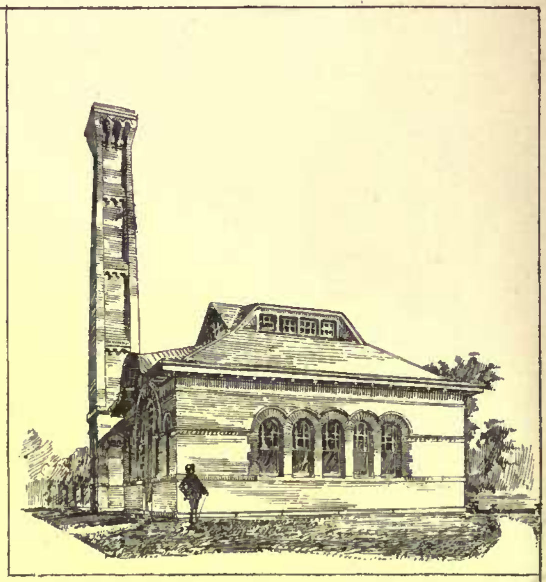


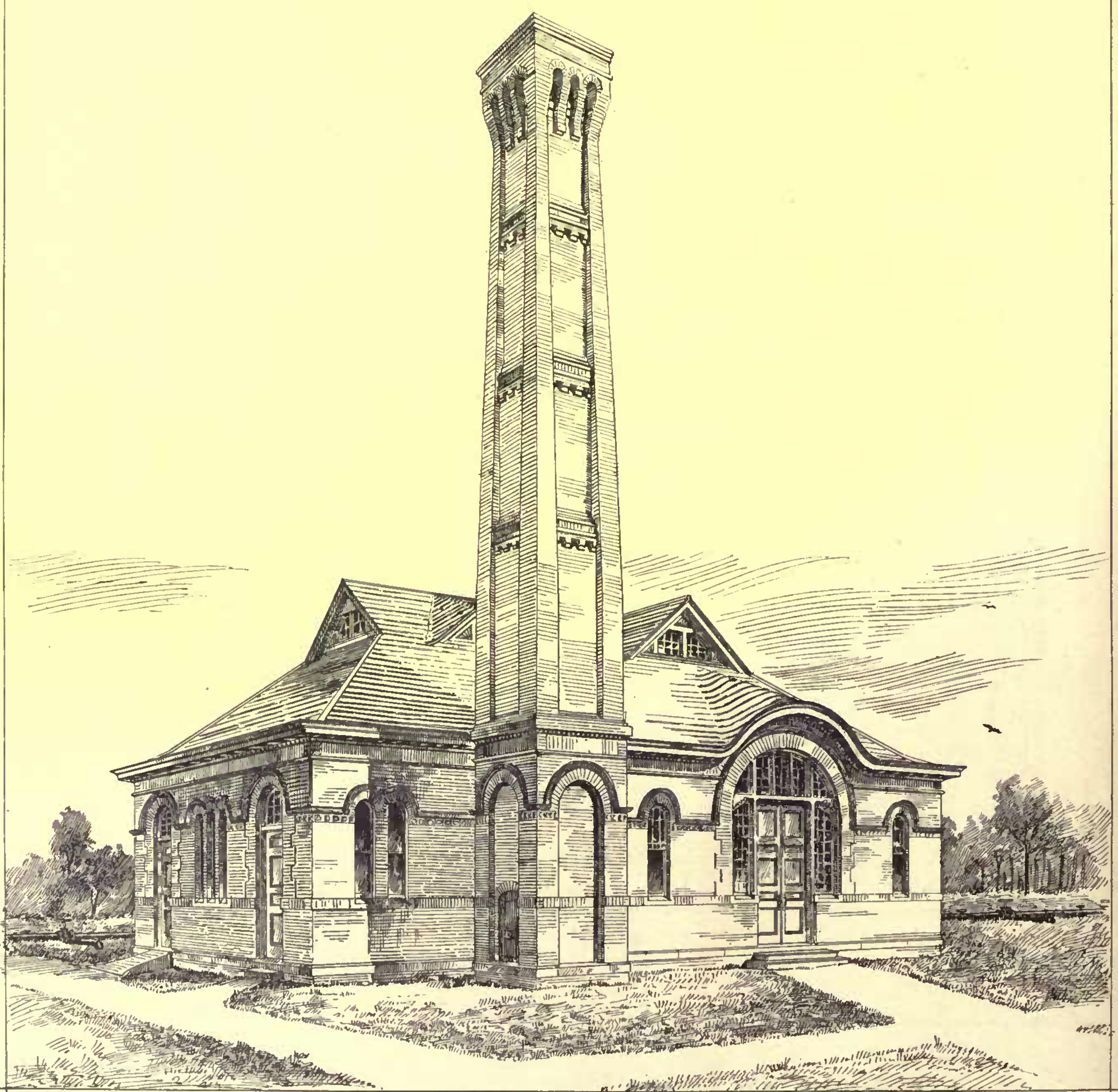
Old Colonial Work, VI.

Heliotype Printing Co. Boston

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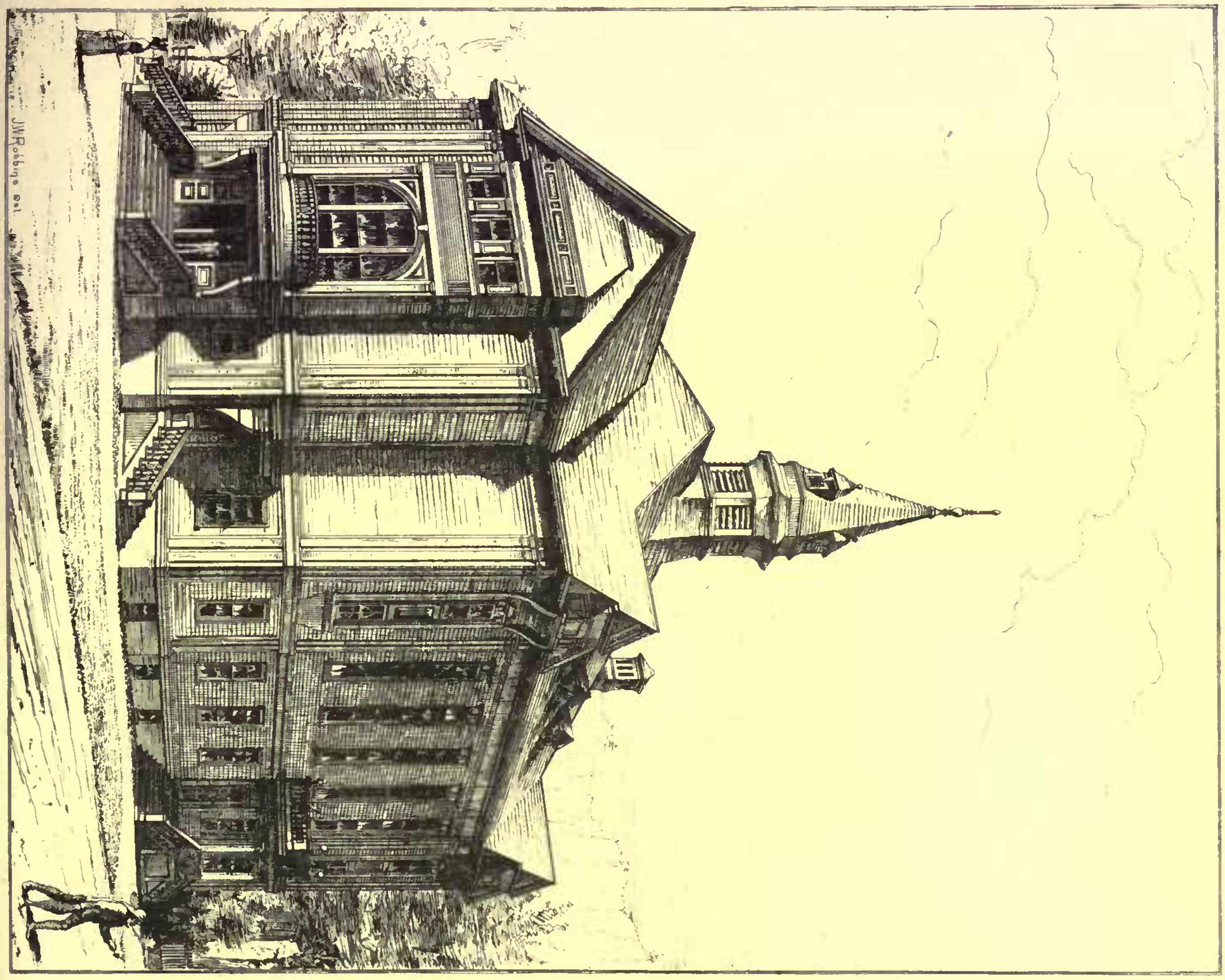


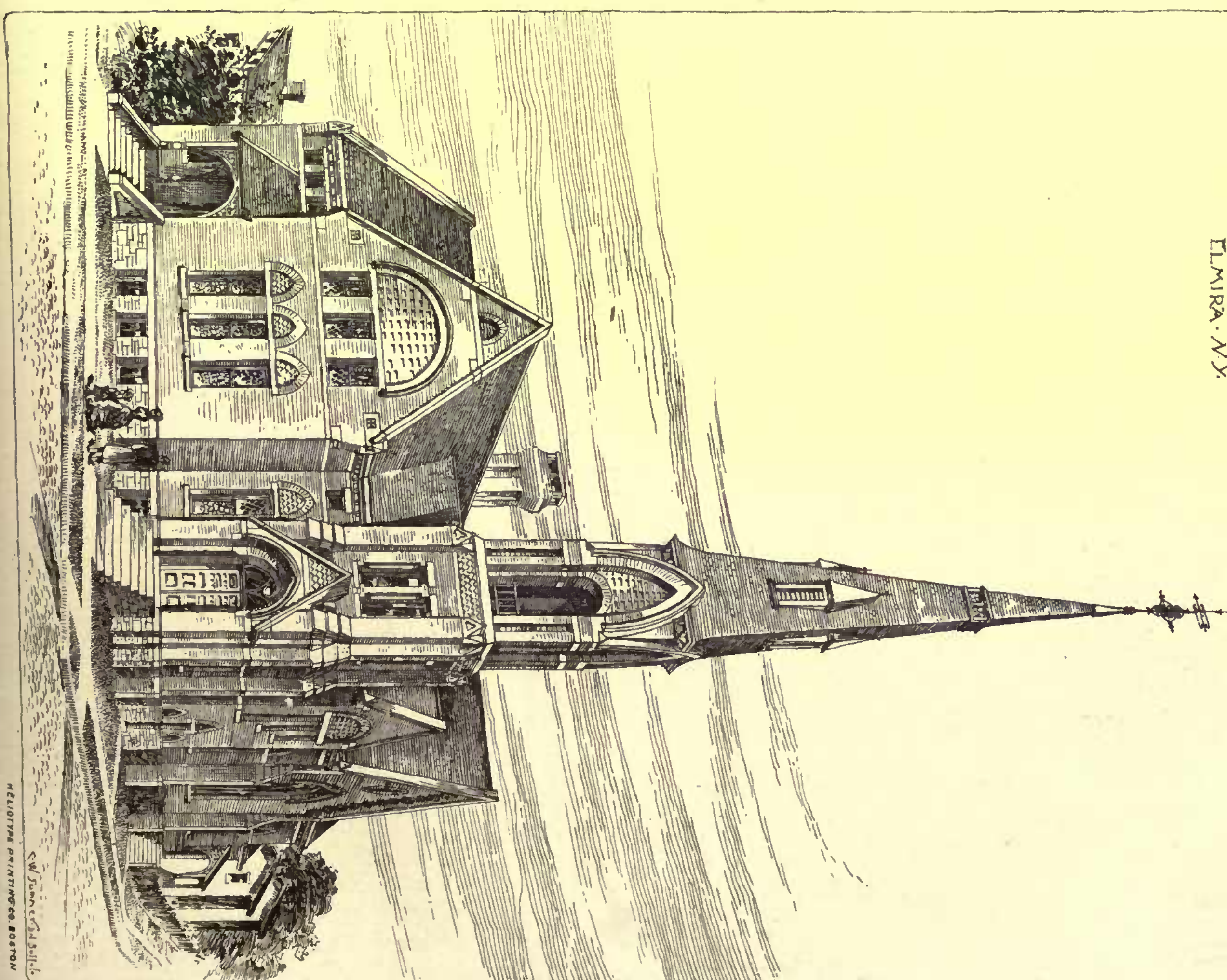


PUMPING STATION FOR BROOKLYN WATER WORKS: CLEAR STREAM: L.I. A.D.F. HAMLIN, ARCHITECT: N.Y.

HELIOTYPE PRINTING CO. BOSTON.

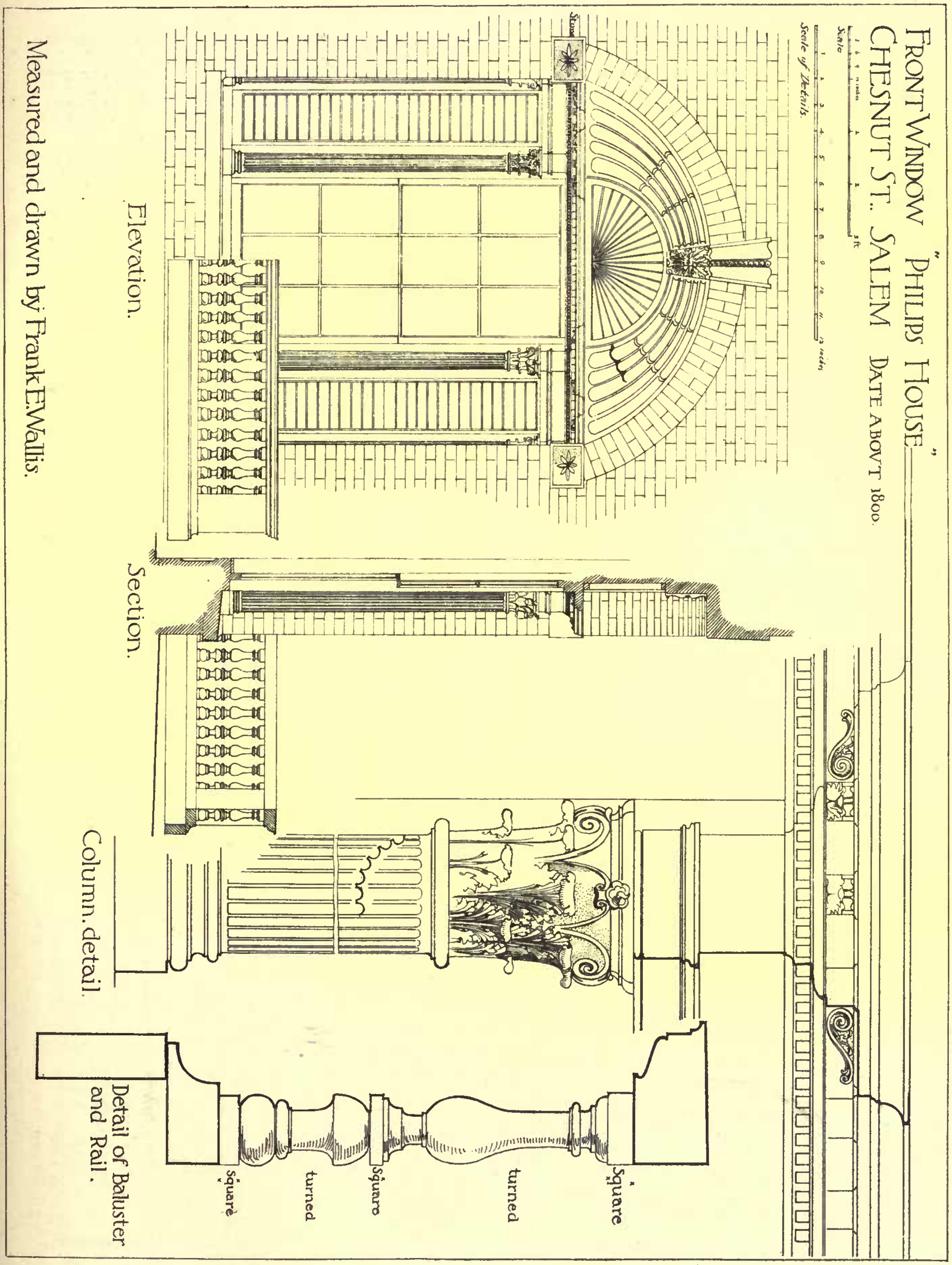
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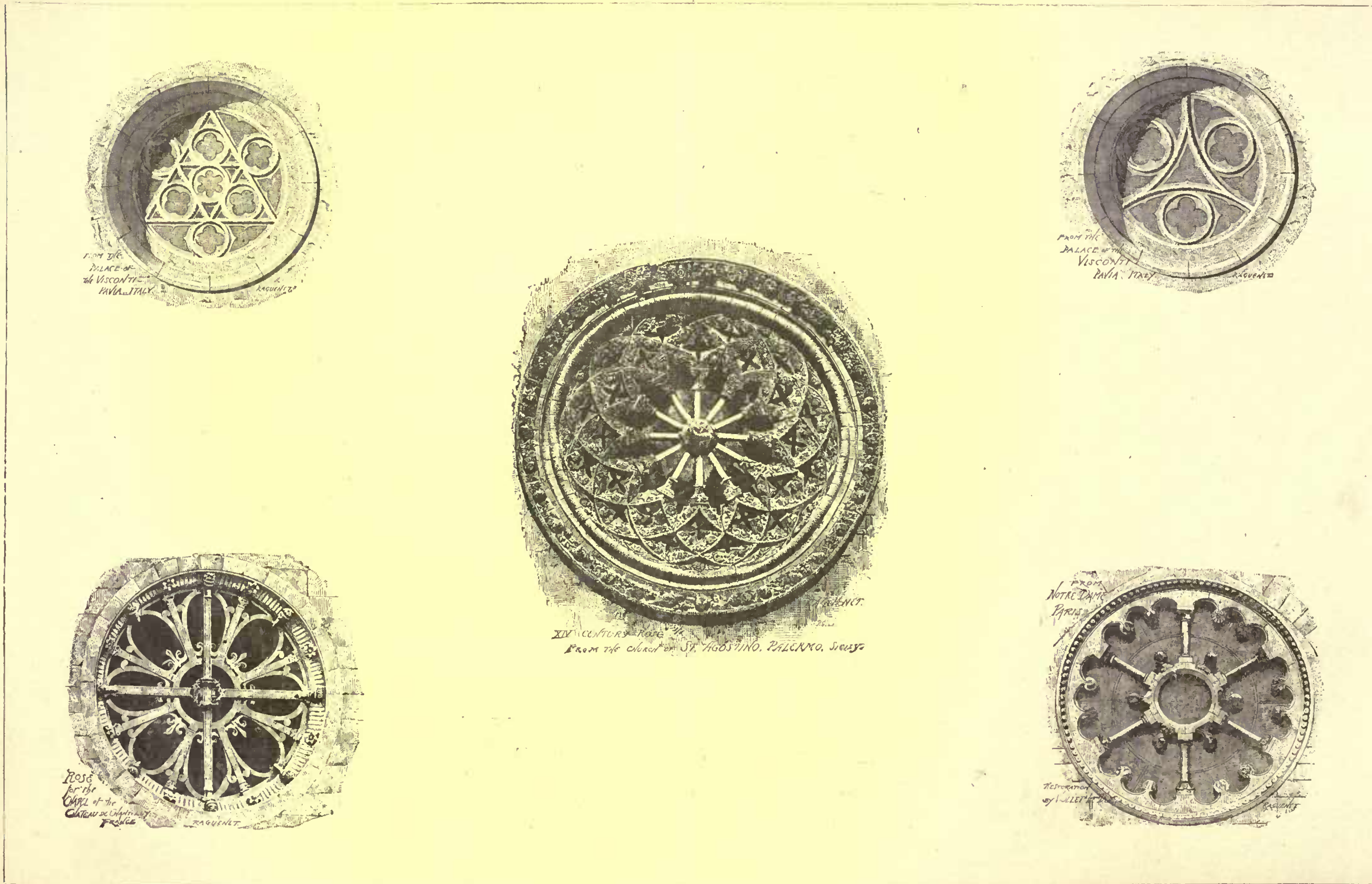


·BAPTIST·CHURCH·CORNING·N.Y.
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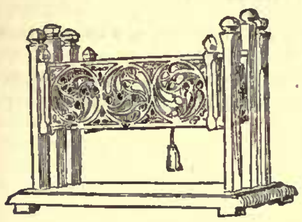
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ROSE-WINDOWS.

SAFE BUILDING.[1]— III.

WRINKLING STRAINS.



THIN pieces of wrought-iron under compression endwise may neither crush nor deflect (bend), but give way by *wrinkling*, that is, buckling or corrugating, provided there are no stiffening-ribs lengthwise.

Thus a square, tubular column, if the sides are very thin might give way, as shown in Figure 2, which is called wrinkling. Or, in a similar way, the top plate of a boxed girder, if very thin, might wrinkle, as shown in Figure 3, under heavy compressive strains. To calculate this strain use the following formula:—

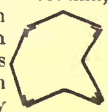


Fig. 2.

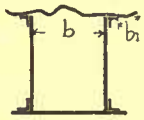


Fig. 3.

$$b = d.\left(\frac{w_r}{w}\right)^2 \qquad (4)$$

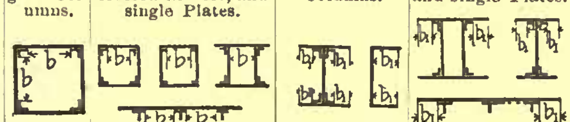
Where w = the amount of ultimate compression in pounds per square inch, which will wrinkle the material.

w_r = a constant,
d = the thickness of plate in inches,
b = the unstiffened breadth of plate in inches.

If a plate has stiffening ribs along both edges, use for b the actual breadth between the stiffening ribs; if the plate is stiffened along one edge only, use $4b_1$ in place of b. Thus, in the case of the boxed girder, Figure 3, if we were considering the part of top plate between the webs, we should use for b in the formula, the actual breadth of b in inches; while, if we were considering the overhanging part b_1 of top plate, we should use $4b_1$ in place of b in formula. For rectangular columns use 160,000 pounds for w_r; for tubular beams, top plates of girders, and single plates use 200,000 pounds for w_r. With a factor-of-safety of 3, we should have $\frac{160000}{3} = 53000$ pounds for rectangular columns, and $\frac{200000}{3} = 66000$ pounds for tubular beams, top plates of riveted girders and single plates.

For w we shall use, of course, $\frac{36000}{3} = 12000$ pounds, which is the safe allowable compressive strain. This would give the following table for safe unstiffened breadth of wrought-iron plates, to prevent wrinkling of plates.

TABLE III.



Thickness of Plate in inches.	Safe breadth in inches of Plate stiffened along both edges. (use b.) Rectangular Columns.	Safe breadth in inches of Plate stiffened along both edges. (use b.) Tubular Beams, riveted Girders, and single Plates.	Safe breadth in inches of Plate stiffened along one edge only. (use $4b_1$) Rectangular Columns.	Safe breadth in inches of Plate stiffened along one edge only. (use $4b_1$) Riveted Girders and single Plates.
$\frac{1}{8}$	$2\frac{7}{16}$	$3\frac{3}{4}$	$\frac{5}{8}$	$\frac{15}{16}$
$\frac{1}{4}$	$4\frac{7}{8}$	$7\frac{9}{16}$	$1\frac{1}{4}$	$1\frac{7}{8}$
$\frac{3}{8}$	$7\frac{5}{16}$	$11\frac{3}{8}$	$1\frac{7}{8}$	$2\frac{13}{16}$
$\frac{1}{2}$	$9\frac{3}{4}$	$15\frac{1}{8}$	$2\frac{7}{16}$	$3\frac{3}{4}$
$\frac{5}{8}$	$12\frac{3}{16}$	$18\frac{7}{8}$	3	$4\frac{11}{16}$
$\frac{3}{4}$	$14\frac{5}{8}$	$22\frac{11}{16}$	$3\frac{11}{18}$	$5\frac{5}{8}$
$\frac{7}{8}$	$17\frac{1}{16}$	$26\frac{1}{2}$	$4\frac{1}{4}$	$6\frac{9}{16}$
1	$19\frac{1}{2}$	$30\frac{1}{4}$	$4\frac{7}{8}$	$7\frac{9}{16}$
$1\frac{1}{4}$	$24\frac{3}{8}$	$37\frac{13}{16}$	$6\frac{1}{8}$	$9\frac{7}{16}$
$1\frac{1}{2}$	$29\frac{1}{4}$	$45\frac{3}{8}$	$7\frac{5}{16}$	$11\frac{5}{16}$
$1\frac{3}{4}$	$34\frac{1}{8}$	$52\frac{15}{16}$	$8\frac{9}{16}$	$13\frac{3}{16}$
2	39	$60\frac{1}{2}$	$9\frac{3}{4}$	$15\frac{1}{8}$

The above table will cover every case likely to arise in buildings.

[1] Continued from page 167, No. 536.

Two facts should be noticed in connection with wrinkling:

1. That the length of plate does not in any way affect the resistance to wrinkling, which is dependent only on the breadth and thickness of the part of plate unstiffened, and
2. That the resistance of plates to wrinkling being dependent on their breadth and thickness only, to obtain equal resistance to wrinkling at all points (in rectangular columns with uneven sides), the thickness of each side should be in proportion to its breadth.

Thus, if we have a rectangular column 30″ × 15″ in cross section and the 30″ side is 1″ thick, we should make the 15″ side but ½″ thick, for as 30″ : 1″ : : 15″ : ½″.

Of course, we must also calculate the column for direct crushing and flexure, and in the case of beams for rupture and deflection, as well as for wrinkling.

Example of Wrinkling.

It is desired to make the top plate of a boxed girder as wide as possible, the top flange is to be 1¼″ thick, and is to be subjected to the full amount of the safe compressive strain, viz: 12,000 *pounds per square inch: how wide apart should the webs be placed, and how much can the plate overhang the angles without danger of wrinkling? Each web to be ½″ thick, and the angles 4″ × 4″ each?*

For the distance between webs we use b in Formula (4).

$$b = 1\tfrac{1}{4}.\left(\frac{66000}{12000}\right)^2 = 1\tfrac{1}{4}.\ 5\tfrac{1}{2}^2 = 37\tfrac{13}{16}'',$$

which is the safe width *between* webs to avoid wrinkling.

For the overhanging part of top plate we must use $4b_1$ in place of b in Formula (4).

$$4b_1 = 1\tfrac{1}{4}\left(\frac{66000}{12000}\right)^2 = 37\tfrac{13}{16}, \text{ therefore,}$$

$$b_1 = \frac{37\frac{13}{16}}{4} = 9{,}453, \text{ or say, } \quad b_1 = 9\tfrac{7}{16}''.$$

The total width of top plate will be, therefore, including 1″ for two webs and 8″ for the two angles, or 9″, and remembering that there is an overhanging part, b_1, each side,

$$9'' + b + b_1 + b_1$$
$$= 9 + 37\tfrac{13}{16} + 9\tfrac{7}{16} + 9\tfrac{7}{16}$$
$$= 65\tfrac{11}{16}''.$$

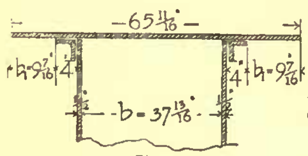


Fig. 4

By referring to Table III, we should have obtained the same result, without the necessity of any calculation. Figure 4 will make the above still more clear.

LATERAL FLEXURE IN TOP FLANGES OF BEAMS, GIRDERS, OR TRUSSES, DUE TO COMPRESSION.

The usual formulæ for rupture and deflection assume the beam, girder or truss to be supported against possible lateral flexure (bending sideways). Now, if the top chord of a truss or beam is comparatively narrow and not supported sideways, the heavy, compressive strains caused in same may bend it sideways. To calculate this lateral flexure, use the formula given for long columns in compression, but in place of l use only two-thirds of the span of the beam, girder or truss, that is $\frac{2}{3}l$, and for w use one-third of the greatest compressive strain in top chord, which is usually at the centre.

Inserting this in Formula (3) we have:

$$\frac{w}{3} = \frac{a\left(\frac{c}{f}\right)}{1 + \frac{4l^2n}{9\rho^2}} \text{ transposing, we have, } w = \frac{3a\left(\frac{c}{f}\right)}{1 + \frac{4l^2n}{9\rho^2}} \qquad (5)$$

where a the area of the cross-section of the top chord in inches,

ρ^2 is the square of the radius of gyration of the top chord around its *vertical axis*; we must therefore reverse the usual positions of b and d, that is the breadth of top chord, becomes the depth or d, and the depth of top chord becomes the thickness, or b (both in formulæ given in last column of Table I.)

w is the greatest allowable compressive strain in pounds at any point to resist lateral flexure safely at that point.

$\left(\frac{c}{f}\right)$ is the safe resistance of the material to compression per square inch in pounds.

l is the total length of span in inches.

GLOSSARY OF SYMBOLS.—The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.:—

a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
𝔇 = *diameter*, in inches.
𝔯 = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle.*

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{I}, a_{II}, a_{III}, etc., or b, b_{I}, b_{II}, b_{III}, etc.

In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance:—

m = moment or bending moment at *centre*.
m_A = " " " *point A.*
m_B = " " " *point B.*
m_X = " " " *point X.*
s = strain at *centre*.
s_B = " *point B.*
s_X = " *point X.*
v = stress at *centre*.
v_D = " *point D.*
v_X = " *point X.*
w = load at *centre*.
w_A = " *point A.*

n is given in Table II.

Example.

A trussed girder is 60′ long between bearings, and not supported sideways; the top chord consists of two plates each 22″ deep and 1″ thick; the plates are 2″ apart, as per Figure 5. The greatest compressive strain on top chord has previously been ascertained to be on the central panel, and to be 525000 pounds. Is there danger of the girder bending sideways?

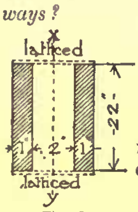


Fig. 5.

The girder is safe against lateral flexure so long as the strain at centre does not exceed w in Formula (5).

Now, the area $a = 2.1.22$

$= 44.$

Using 48000 pounds per square inch for ultimate resistance to compression of wrought-iron, and a factor-of-safety of 4, we have

$$\left(\frac{c}{f}\right) = \frac{48000}{4} = 12000$$

The length is 60′, or 720″, therefore

$l^2 = 518400.$

From Table II we have

$n = 0{,}000025.$

And from Table I, section Number 16, we have for the above cross-section,

$$\varrho^2 = \frac{d^3 - d_1^3}{12(d - d_1)}$$

As we are considering the section for bending sideways, we must, of course, take the neutral axis $x \cdots y$ vertically, therefore d becomes 4″ and d_1 becomes 2″. This supposes the plates to be stiffly latticed or bolted together, with separators between. We have then

$$\varrho^2 = \frac{4^3 - 2^3}{12(4-2)} = 2\tfrac{1}{3}$$

Then for w we have,

$$w = \frac{3.44.12000}{1 + \frac{4.518400}{9.\ 2\frac{1}{3}}\,0.000025.}$$

$$= \frac{1584000}{1+2{,}47} = \frac{1584000}{3{,}47} = 456\ 484 \text{ lbs.}$$

Or, we find that there is danger of the girder bending sideways long before the actual compressive strain of 525000 pounds has been reached. It will, therefore, be necessary to re-design the top chord, so that it will be stiffer sideways. This subject will be more fully treated when considering trusses.

TENSION.

In tension the load is applied *directly* to the material, and it is, therefore, evident that no matter of what shape the material may be, the strain will always be the same. This strain, of course, will be just equal to the load, and we have, therefore: —

$s = w.$

Where $s =$ the amount of strain.

Where $w =$ the amount of load.

The weakest point of the piece under tension will, of course, be where it has the smallest area of cross-section; and the stress at such point will be equal to the area of cross-section, multiplied by the amount of resistance its fibres are capable of.[1]

The amount of resistance to tension the fibres of a material are capable of is found by experiments and tests, and is given for each material per square inch of cross-section. A table of constants for the ultimate and safe resistances to tension of different materials will be given later; in all the formulæ these constants are represented by the letter t.

We have, then, for the stress: —

$v = a.\ t$

Where $v =$ the amount of ultimate stress.

Where $a =$ the area of cross-section.

Where $t =$ the ultimate resistance to tension, per square inch of the material.

Therefore, the fundamental formula (1), viz.: $v = s.\ f$, becomes for pieces under tension: —

$a.\ t = w.\ f$, or: —

$$w = a.\left(\frac{t}{f}\right) \qquad (6)$$

Where $w =$ the safe load or amount of tension the piece will stand.

Where $a =$ the area of cross-section at the weakest point (in square inches).

Where $\left(\frac{t}{f}\right) =$ the safe resistance to tension per square inch of the material.

Example.

A weight is hung at the lower end of a vertical wrought-iron rod, which is firmly secured at the other end. The rod is 3″ at one end and tapers to 2″ at the other end. How much weight will the rod safely carry?

The smallest cross-section of the rod, where it would be likely to break, would be somewhere very close to the 2″ end, or, say, 2″ in diameter. Its area of cross-section at this point will be: —

$$a = \frac{22}{7}\ .\ \frac{2^2}{4} = 3\tfrac{1}{7} \text{ square inches.}$$

The ultimate resistance to tension of wrought-iron per square inch is, from forty-eight thousand pounds to sixty thousand pounds. We do not know the exact quality, and, therefore, take the lower figure; using a factor-of-safety of four, we have for the safe resistance to tension per square inch: —

$$\left(\frac{t}{f}\right) = \frac{48\ 000}{4} = 12\ 000 \text{ pounds.}$$

Therefore, the safe load will be: —

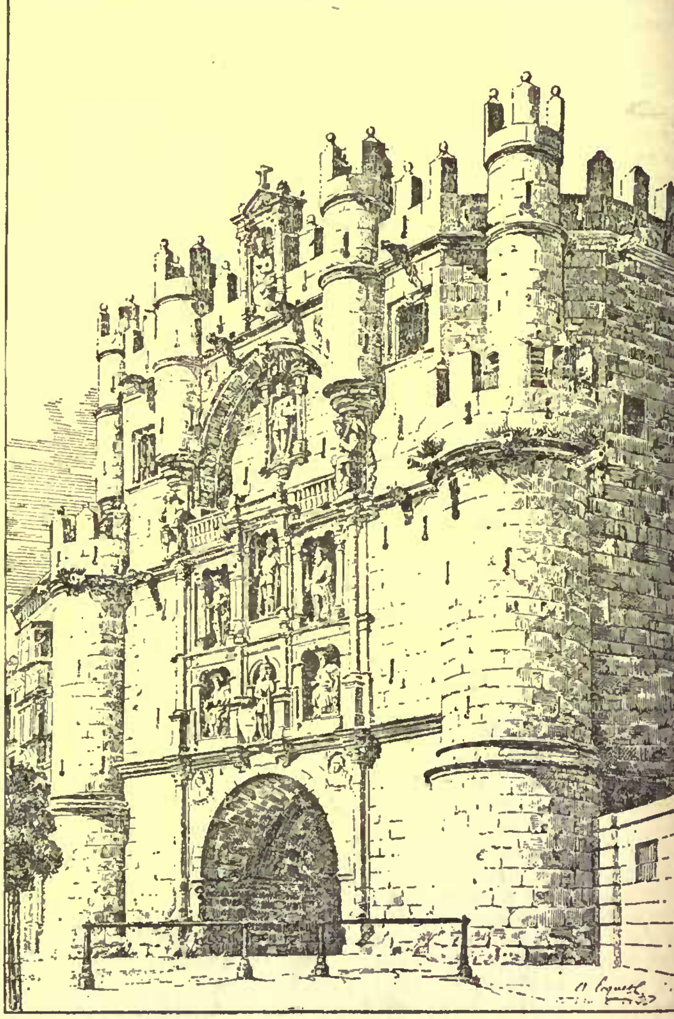
$$w = 3\tfrac{1}{7}.\ \ 12\ 000 = 37\ 714 \text{ pounds.}$$

[To be continued.]

[1] This, again, is not theoretically correct, as a piece under tension is apt to stretch, and so reduce the area of its cross-section; but the above is sufficiently correct for all practical purposes.

THE INFLUENCE OF ARCHITECTURE ON CARPENTRY.

Arch of Santa Maria, at Burgos, Spain.
(Rep. Gen. Soc. Arch'ts. Paris)



THE last of the present course of free lectures delivered under the auspices of the Carpenters' Company was given at their hall in Londo -wall, a few weeks ago, by Mr. Banister Fletcher, M.P., F.R.I.B.A., who took as his subject the actual work of carpentry in all ages, and its action and reaction upon architecture. The facility which both architect and carpenter must each possess in order to attain excellence must be, the lecturer pointed out, the power of earnest thought on his work. The architect's was the inventive quality of art, the carpenter's was the actual work. The artist's pencil and the carpenter's tools, though wielded with the utmost skill, would, in the absence of earnest thought, produce but poor and imperfect results. Technical excellence had its limits, to be reached by patient study; but the production of a new design or an original thought could never be arrived at by simple study, however closely applied.

Turning a moment to consider the birthplace of architecture, it would be seen that a primæval civilization like the faculties of childhood could necessarily only conceive simple ideas, and these were converted into the first tangible forms of construction. The rapid architectural development of the earlier nations must be ascribed to the constructive faculty of mankind; but the epoch of simplicity of construction gradually yielded under the dominion of fresh requirements,

stimulating the forerunners of the art to increased efforts. The post and rail construction gave place to a more homogeneous mode of building, and bit by bit construction more or less rude was added.

Man having satisfied the natural cravings for a mere shelter, commenced his first efforts at architectural embellishment, and the lecturer thought, even in these late days, advantage might be derived from a little more attention being paid to the sources from whence sprang the germs of architecture. In early buildings the carpenter held an important place, and he was, in fact, the architect, with the advantage over modern ones that he put his ideas into execution, so that he was able to import into his work the nameless something which stamped it with the impress of a master mind. After the final decay of architecture in its Southern birthplace, a new creation arose in its Northern borders, and it was to the new creation that we owed the roofs of modern Europe. During this period the art of carpentry advanced by leaps and bounds, till we stood gazing with awe and wonder on the marvellous beauties of construction left us in many a wide-spanned roof of church and hall. These were no formal copies of the work of preceding ages, but the mere outcome of earnest thought brought to bear on its new conditions. During the Norman period, the roof, though plain, was often open to the actual frame timbers. It was evident, from the weather mouldings which frequently remained to this day on Norman towers, that the outer roofs of this style were often of a high pitch, but sometimes they were very low. They appeared to have had generally, if not always, the beams placed very near together, on the under side of which a flat-boarded ceiling was perhaps made. It might be doubted whether any example of this period now remained, though we had sufficient evidence to show what they were in several instances. Portions of some very remarkable wooden roofs of this style remained at Oakham and at the Bishop's Palace, Hereford.

Of the Early English style a few roofs still remained in country districts, especially in Sussex. They were of steep pitch, and either canted or of a circular form like a barrel vault, and had generally tie-beams. Halesowen Parish Church, Salop, and one of the aisles of Rochester Cathedral had roofs with moulded beams clearly of Early English character; and at Old Shoreham was a tie-beam with the tooth ornament on the original circular braces.

Coming to the Perpendicular period, we find in Westminster Hall one of the finest specimens of a large span roof. The principals were here made into a sort of trefoil arch, and the interstices of the framing were filled with panellings; there were also arches from one principal to another. Of the same class were the roofs of Crosby Hall, Bishopsgate, and Christ Church, Oxford; but this type of roof was not common in churches where the flat, or nearly flat-ceiled roof was more usual. Half-timbered houses were frequently erected in this Perpendicular period. both in this country and in Germany and France. The houses of the richer burghers were often constructed in this manner, and were enriched with ornamental carving. This woodwork, while not belonging to art of a very high order, being generally entirely executed by the carpenter, was pervaded, as a whole, by a peculiar charm. In our own country, especially in Warwickshire and Cheshire, numerous picturesque specimens could be seen, and a holiday would be well and pleasantly spent in studying the examples remaining in Warwick, Coventry, or Chester. In most cases, if the works were minutely examined, it would be found to bear the impress of careful artistic work, rightly applied, although in many instances these were purely the action of the individual workman's ideas. However much work had been lavished on a building, seldom was the same moulding, stop, or ornament employed throughout, and this constituted the real charm of the treatment.

In order to show the advantage of living among and studying these works, the lecturer showed two moulded ends to beams, both the outcome of the workman independent of architectural control, both taken from buildings erected in Warwickshire. The one, which was refined in all its details, was taken from the neighborhood of artistic old work; the other, debased and clumsy in character, was surrounded by stucco and sham art. Much in the same way architecture always affected carpentry, and he held that it was only by architects working up to a high standard of art that the workman could improve himself.

In discussing these wooden house fronts, roofs, and other huge pieces of mechanism, which developed in boldness and variety, it should not be overlooked that the abundance of oak timber in the north of Europe both suggested much of this art, and admitted of bold features of construction from the size of the logs and the tenacity of the material. Timber was in the fifteenth century to be had at low prices and in any quantity. Whole cities were mainly constructed of timber. The houses were framed together with posts about sixteen inches square in section, arching outwards, and meeting the projecting floor timbers, and so with the upper stories. In the Rows of Chester, an open gallery or passage was left in the first floor within the timbers of the house fronts. Projecting oriels often jutted out from these overhanging stories, and the spaces between these framing pieces were filled-in with laths and mortar, or in later years with glass. In London, Rouen, Blois, and Coventry, the angle-posts were occupied by niches having statuettes in them, or fifteenth-century window-tracery was sunk in the surfaces. Most of the ornamental work to the early half-timbered houses was confined to the ends of joists, beams, and posts, and it was not till a later date — about the sixteenth century — that the panel spaces were filled in with useless ornament, having nothing to do with the construction, and in no way improving the beauty of the work.

He would, in the next place, consider carpenter's work in furniture, both ancient and modern, with a view of inquiring if even in this branch of work the carpenter had not had some share in aiding the cause of progress. In the British Museum were preserved some Egyptian chairs which, from the simplicity of their construction, were well worthy of a visit, putting aside their wonderful preservation after the lapse of centuries. Another old piece of furniture was St. Peter's Chair, at Rome, and this old piece of work, though at times repaired, still retained much of its ancient character. During the sixteenth century especially, furniture possessed an architectural character in its outlines. In the fifteenth century, chests, screens, stall fronts, doors and panelling followed or fell in with the prevailing arrangements of architectural design in stonework, such as window-tracery or wall-tracery. But in the sixteenth-century, furniture, architectural character not proper to woodwork for any constructive reason was imparted to cabinets, chests, etc. They were artificially provided with parts that imitated the lines, brackets, and all the details of Classic entablatures when these had constructive reasons, but which, reduced to the proportions of furniture, had not the same property. These subdivisions brought into use the art of "joinery." As the vigor of the great sixteenth-century movement died out, the mania for making furniture in the form of architectural models died out also, nor did it again become the fashion until quite modern times, under the Gothic and other revivals, at the end of the last and the beginning of the present century. The architectural idea was in itself full of grandeur, and productive of very beautiful examples in the sarcophagus-shaped chests or cassoni or cabinets, although the façades of temples, the vaults, columns, and triumphal arches of Rome would not bear reduction to such small proportions. With the introduction of marquetry into more general use, there was apparent, not only a new or renewed method of decoration, but a changed ideal of construction. Pieces of furniture were no longer subdivided by architectural mouldings and columns, all such meant extra work added to the sides and fronts.

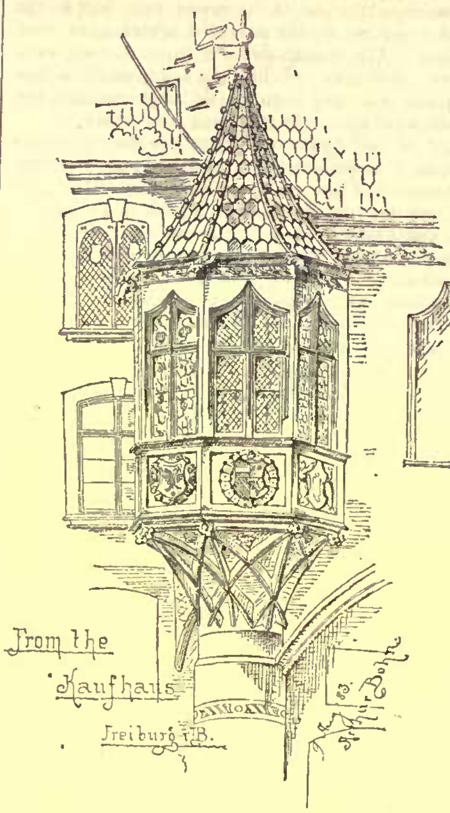
The lecturer asked why modern carpenters had not taken in hand some of the work required in designing and executing furniture. At no period had there been such a demand for good, sound, solid and substantial work in this direction, work, in fact, well within the carpenter's domain, and a large field was open to the craft in the future. Why should not the hall furniture of a modern house fall entirely to the share of the carpenter? Mr. Fletcher exhibited some hall furniture he designed for his own residence and had executed solely by carpenters some seventeen years ago. They had thus seen in their survey of art, as far as traced, a continual progress of human ideas and conceptions, beginning with evolution, followed by imagination, and completed by adaptation. When they looked from their present standpoint of critical examination as to the real manner and use of the various means of construction, it must be counted an anachronism that their predecessors of the last century, incapable of comprehending the true spirit of preceding ages and the principles on which their work was based, should have been so fond of reproducing archaic forms of construction, false alike in art and principle, and unsuited to a material in which they wrought. The error into which they fell was that they attempted only to reproduce the forms of older work without regard to its spirit. What we wanted was the love of truth that animated the workers in olden times, and when we had mastered the first principles of such a revival, we should be on the high road to success. The designer should so use every material dealt with as to bring out its distinctive properties. One great and too common error was that of not letting well alone. How often did we find a well-moulded beam spoilt by the addition of meretricious ornament, having nothing in common with the member itself, and injuring by its presence what it was intended to enhance.

As a result of the spread of technical schools, art was, he was pleased to notice, making its influence felt in our workshops, and he was hopeful that in the not far distant future our workmen would take their right place in the hierarchy of art, and a better understood connection between the arts of construction and design would assuredly be the outcome. More than anybody, the carpenter had greater opportunities in the present day of improving his knowledge. Nearly every modern roof proclaimed the fact from the housetops. The roofs of our Georgian forefathers were perhaps nearly without exception the most unobtrusive frauds of a sham age. Concealed between lofty parapets from without, and by lath and plaster from within, sham construction and scamped work went on hand-in-hand unchecked; but a change for the better had now opened, and instead of seeking to hide his work, each architect vied with the other to show more and more both of the roof and its construction. No one could deny that the change was for the better. The man of all others to whom our thanks were due for this alteration in public taste was the late Mr. Pugin. He it was who first played havoc with the old tie-beam school of construction, without which the whole superstructure of collars and braces would have fallen to the ground. In our enthusiastic effort after the ideal we were sometimes apt to adopt archaic forms, which in our sober moments we were sorry for. He referred more particularly to the debased form of French and Flemish roofs just at present in vogue of the bedpost order, wherein the canons of the constructive position of materials was set at nought. The old carpenters evolved from their experience the constructive excellence that we found in most of their work. We must not, in our efforts to be eclectic, sin on the other side, and lose all trace of real worth. One point that was sometimes overlooked in adapting

old examples by rule of thumb was that the adapters failed to take into account the age in which the works were executed. The extra strengths of timbers in old roofs had been the main cause of their stability. Parts evidently designed under the direct laws of stress, intended originally to act as a strut, had, under changed conditions, come to serve the purpose of a tie, and if, on examination, the piers had given way, we might be certain that some power other than originally intended had been exerted, as pins could never have been properly utilized where tension of the part was presupposed. The peculiarity of the present position of architecture was the reversal of the conditions under which it progressed. In the past the secular element was subordinated to the religious conception; now the utitarian preceded all others, and it was the multiplicity of the requirements of our latter-day architecture that made the fulfilment so difficult a task. It was the continuation of the analytical and synthetical methods that was now necessary to elaborate a definite system. To the young man starting in life his advice was: study anywhere and everywhere, but learn to sift the tares from the wheat, striving to remember that old work was not necessarily good because it was old. If the young could strip self and learn to follow the spirit that animated the constructure of the thirteenth century — the period when construction had attained its full development — without copying all its forms and conditions, he would eventually retain something worth knowing. The unfortunate part of it was that the workman, like too many members of the architectural profession, only make bad copies of the old forms, taking little heed of the different conditions and requirements of the work. Mr. Fletcher quoted from the late G. E. Street's last address at the Institute, in which solid construction was insisted upon, and from a recent Academy lecture by Mr. Aitchison, pointing out that construction was best when it decorated the material employed for construction. The lecturer continued: I think that jerry building has had its day, that the work of the future will be solid, substantial work, that solid woods will be used, and veneer discarded. I find houses built from my designs, and in a solid manner by so-called speculative builders let and sell far more quickly, though a larger price is asked for them than for the usual flimsy class of house, whereas these stronger, more solid, and more expensive houses would not have let or sold a few years ago. In my judgment, therefore, the time has arrived when to build solidly and well will pay best even the speculative builder, and this will make the carpenter more than ever in request if he will give his attention to technical knowledge. The scope of his trade will be increased, for the demand for solid and substantial houses will influence the furniture therein, and the carpenter and joiner may certainly make the hall and dining-room furniture, the panelling of ceiling, in conjunction with enamelled iron, the dadoing of halls and rooms, the solid parquetry of floors. The great thing that the carpenter must remember is that he must cultivate taste, for this now pays, and its cultivation is one of the weapons we have against foreign competition. Everything the carpenter does should bear progress of his trade; all being solid, simple, yet tasteful. Where he can, he should build his cottage with some portion of half-timbered work, barge-boards, etc., if not prevented by local regulations; he should be content with bare walls at first, and gradually panel and fit up each room. Nothing will more help to elevate his own taste and the taste of his neighbors, and it should be borne in mind that he will be educating himself as an art workman, and thus the carpenter will be helping to influence the architecture of the future.

Painting Microscopic Slides. — An exchange tells of a visit to the house of a microscopist, who thus describes some of his treasures: "I have several little things to tell you that are not known except by microscopists. Here is a slip of glass, for instance," he continued, as he picked up a narrow glass-slide, "which contains the representation of a beautiful bouquet of flowers. The representation, when looked at with the naked eye, can scarcely be seen at all. It simply looks like a small shot. The bouquet, when you look at it through the instrument, contains, as you can discover, eighty-two distinct flowers of various shades and colors; and each is as perfect as it would be possible for an artist to represent it on canvas. The entire bouquet, including all the flowers, leaves, etc., was made from the scales and hair of Brazilian butterflies. The dust from the wings of the butterflies was picked up and placed in position by Henry Dalton, of London, who is now dead. Dalton, with the aid of a microscope, picked up one particle of the dust at a time on the end of a hair, and adjusted it to the slide in such a manner that, when his task was finished, the bouquet assumed its present beautiful and perfect form. Although Dalton was dissipated, he excelled most of his imitators in his peculiar line of art. Among microscopists his works are prized as highly as the works of the great masters in painting are valued by artists who work on canvas. A painter who can paint a complete scene on a surface as small as a sleeve-button is considered skilful; yet Dalton used a single hair for a brush, and dealt with particles of matter scarcely visible to the naked eye, which he placed in their respective positions with the aid of his microscope with such accuracy that he finally produced his representations, which are so correct in every detail that artists who have examined them critically have been almost overcome with astonishment. This is what I call one of the wonderful achievements of the century. He was a fast worker, and, by laboring almost incessantly, he could finish it, I think, in the course of a week or ten days. The Dalton slides are very valuable in America. There are not more than fifty Dalton slides in this country, and they can scarcely be purchased for love or money. In fact, as I have said before, they are as highly prized by microscopists throughout the world as a rare painting by a celebrated master is prized."

A NEW SYSTEM FOR SUBAQUEOUS FOUNDATIONS.[1]



In carrying out pneumatic foundations an iron caisson of the form of the object required is generally used as a working chamber. The masonry carried up upon this is usually constructed within an iron sheathing, which serves to protect the new work from injury by friction as it is pressed down into the ground, and also acts as a coffer-dam. The caisson and the sheathing remain permanently in the structure. Many attempts have been made to lessen the cost of this system, caused by the loss of the iron. Works have been carried out in which the caisson served only as a diving-bell, and was afterward removed; but this method, apart from its great cost, only answers where the foundation does not go deep into the bottom, and then only for special cases. In another direction saving of cost has been sought by removing the upper iron sheath after the masonry has been carried up sufficiently high and using it again.

Already in 1851 Pfanmüller had suggested, in a scheme for bridging the Rhine at Mainz, that the upper portion of the iron sheaths for the piers should be screwed off when the masonry was carried up above the water-level, and used again at another pier. In the case of the Saltash Bridge, Mr. Brunel removed the iron cylinders, thirty-seven feet in diameter, for the whole depth of about fifty-six feet, in which the piers were not imbedded in the bed of the estuary. In constructing the Antwerp quays the contractors built the masonry, which was founded upon pneumatically-sunk caissons within massive iron sheathings, which, when the masonry was far enough advanced, were unbolted from the caissons, lifted bodily and reused at another part of the wall. As the foundation of the masonry did not go far into the solid, the friction to be overcome in lifting these sheathings was not great.

In 1882 the Società Italiana began the founding of a quay wall about two hundred yards in length along the corrected course of the Tiber for the protection of the Villa Farnesina. The work was all done in the dry, the great curve of the Tiber not being cut out till later. The wall was founded upon a series of iron caissons, sixty-five feet seven inches long, fifteen feet nine inches wide, and twenty-nine feet six inches deep. The masonry was brought up for twenty-three feet in rough tufa and puzzuolana mortar, and for the remaining six feet with a facing of travertin blocks. A sheathing of unusual construction, which was put up to its full height at once, was used, perhaps rather as a protection during the sinking for the rough masonry in slow-setting mortar, than as a coffer-dam in which to build the upper masonry. This sheathing consisted of vertical iron plates 23.6 inches wide, connected together by two flat bars riveted together between which the edge of the plates was pushed. There was no filling or calking of the joints, and no attachment to the caisson. When a length of walling was finished, the plates and bars were pulled out and used again in another length.

Inspired by these works, Mr. Gaertner designed a "foundation mantel," which easily takes to pieces, and is adaptable to any form of caisson. It consists of vertical plates, 0.2 inch thick and two feet seven inches wide, in six foot seven inch lengths, joined together at the horizontal points by double cover-plates and a double row of bolts. Laterally these plates are kept in position by fitting into a riveted I formed of two bars, 5.09 inches x 0.47 inch, separated by a bar, 2 inches x 0.27 inch, all three being riveted together. The vertical plates are not fastened to these I-irons, but the joint is calked. The I's break joint with the plates, and are only lightly attached to the caisson.

In the winter of 1883–84, the two abutments and two piers of the bridge over the Wisloca at Dembica, in Galicia, were erected upon this plan. The area of the foundation of the abutments is sixty-eight square yards each, and of the piers fifty-seven square yards.

[1] Abstract in the Ex. Min. of Proc. of the Brit. Inst. Civil Engineers of a paper by E. Gaertner in the *Wochenschrift des Oester-Ingenieur und Architeckten Vereins.*

The foundations varied in depth from twenty to twenty-six feet below low water, and from twenty-eight to thirty-seven feet below the ground level, and four to five rows of the movable plates were used, according to circumstances. The materials sunk through were sand and gravel first, and, lower, stiff clay. When the foundation of one pier was completed and the masonry brought up high enough, the sheath was removed to the next pier. It was used four times.

To obviate any danger of bolt-heads or other projecting pieces catching on the masonry as it is being drawn out, the space between the sheath and the masonry is filled with sand as the latter progresses. The sheath is removed by windlasses, which draw out the vertical plates and fish-joints one by one. The joint between the sheath and the caisson is simply broken in this operation. The weight of the sheath, including all joints and fastenings, is for the lowest row of plates nineteen pounds per square foot, and for the rest 15.6 pounds. If the plates have to be re-used over a caisson of different shape from the one from which they are being taken, it may be necessary to bend them to the required curve, and to this end they must be of the best material; the vertical fish-joints are the same for all shapes of caisson. It has been intended to make careful tests to ascertain the amount of friction encountered in drawing off the sheath, but the floods of June, 1884, made it necessary to get the work done as soon as possible, and the tests were therefore confined to the right pier, which was one hundred and fifteen feet from the bank, and founded 21.6 feet below low water, and thirty-eight feet below the surface of the ground, made up of

Sand and clay	10.50 feet
Loose stones and sand	18.60 feet
Firm clay	8.90 feet

While the sinking of one of the caissons was in progress, the giving way of the joints of two of the vertical plates at their joining with the caisson gave the opportunity of calculating the external friction, the bottom of the caisson being at the time 5.2 feet below low water, and 23.3 feet below the surface of the ground. This gave a resistance due to friction of 5.1 tons per foot run of circumference, equivalent to 492 tons per square foot of surface of the sheathing. These and some observations of other plates which gave way on the further sinking of the caisson, taking into account the degree in which they followed the caisson or stayed behind, showed that the earth pressure on the inside of the sheathing is proportioned to the friction, just as is the case on the outside.

These slight observations showed that the co-efficient of friction inside is at least as great as, if not greater than, that outside, and that, therefore, passive earth-pressure produces as great an amount of friction as active earth-pressure. It was now of interest to determine the resistance to friction when both surfaces of the sheathing were sliding, as is the case when the sheathing is drawn off, instead of only one, as in the former cases, and whether, as must be theoretically assumed, the resistances work simultaneously on both sides of the plate, and are thus proportional to the sum of the inner and outer co-efficients of friction. If this is so, a comparison of the theoretical calculated outside friction with the observed resistance to the drawing-up of the sheathing should show the former to be at most one-half the latter. The calculations have been made for all the cases in which the plates were above water (there being no theory giving useful results for material permeated by water).

The theoretical earth pressure was determined by Rebhann's construction, in which the weight of the material was taken at 98.3 pounds per cubic foot, and the angle of repose for sand with loam at 38°, and gravel and sand 36°. After a long series of observations, the co-efficient of friction for the outside was found to be 0.466, and for the inside 0.588, or twenty per cent greater than the outside friction. The results of the calculation were reduced to diagrams which thoroughly proved that with the simultaneous action of two surfaces of the same body (as in the case of the sheathing when being drawn off) the resistances to friction act simultaneously on the two surfaces, and therefore must be added together.

a.	b.	c.	d.
Depth below surface of ground in metres.	Mean resistance to the winding up of the vertical plates of the sheathing.		
	Per plate 2 ft. 7 ins. wide.	Per metre of circumference of sheathing.	Per square metre of sheathing.
	Tonnes.	Tonnes.	Kilograms.
1.0 (3.28 feet)	0.140 (0.138 ton)	0.177 (0.053 tons per foot)	177 (36.3 lb. per sq. ft.)
2.0	0,560	0.709	354
3.0	1.390	1.759	586
4.0	2.620	3.316	829
5.0	4.560	5.772	1,154
6.0	5.550	7.025	1,171
6.5	6.290	7.962	1,224
6.75	7.290	9.227	1,367
7.10	9.150	11.582	1 631
7.50 (24.6 feet)	11.316 (11.13 tons)	14.316 (4.295 tons per foot)	1,908 (391.1 lb. per sq. ft.)

The above table refers to the land pier on the right bank of the Wisloca. From this table it is seen that the friction at considerable depths, and especially where the earth is saturated with water, increases very rapidly. The mean water-level in the case of the pier to which the table refers was about 4.7 m. (15.4 feet) below the surface of the ground. The observations and calculations described in the paper were made by Mr. Adolf Titze, who was the engineer in charge of the works on behalf of the firm who built the bridge, the author of the paper being a member of the firm.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

THE EFFECT OF WIND ON PLUMBERS' TRAPS.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In a two-story house, with a horizontal run of soil-pipe of about thirty feet, from a running trap to the vertical part about forty-five feet high, about which were grouped in basement, first and second story the usual fixtures each with its own branch from soil-pipe, I recently observed the effect of a rather high and "gusty" wind. The fresh-air inlet was two inches, the soil-pipe four inches, open at top, extending well above ridge of a gambrel roof, but ten feet or so from the ridge. The closet was a short hopper, and most of the traps of other fixtures were S-traps with five-inch seal, and not vented. Although the discharge of any fixture in this house has scarcely any effect on the seal of the trap of any other fixture, yet this wind caused a rise and fall of nearly, if not quite, one and one-fourth inches. This was no more of a wind than might occur a half-dozen times in an ordinary season. This is a case that vent-pipes would not help, and had the shallow traps, so common, been used, the house might have been favored with air from the pipes.

It has been fashionable among architects to make game of ventilating caps, but the subscriber purposes to try some of them and see if they will steady the water in these traps. MR. PINCH.

BRIBES.

NEW YORK, April 26, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— Alluding to your article in the number for April 17th, entitled "Corruption Again," permit me to say that I fear the evil is more deeply rooted than at first sight appears. Certainly in this community, outside of professional circles, the custom of taking and giving commissions for any service is generally prevalent, and to refuse to pay would be regarded as dishonorable, while to reject an offered payment would seem, to most men, mere Quixotism. From the tip to the waiter, to the cash to the alderman, every one seeketh gifts and followeth after rewards. Nor is it an epidemic of recent appearance — it has grown year by year — the causes are below the surface; unless I am much mistaken, you will find it increase, rather than diminish in the future. The strength of it lies in the fact that it is more difficult to get work to do than it is to do it, and to change this condition of affairs will require more than hopes.

Respectfully yours, JOHN BEVERLEY ROBINSON.

[THE offering of commissions, discounts, rebates and concessions of one kind or another to one's own customer or to an unemployed agent to induce him to bring in orders, is a perfectly legitimate means of securing business. To offer any inducements of this kind to an agent already in the employ of another person, as an architect is, is bribery, corruption and crime, as it tempts the agent so approached to commit a crime punishable at law. In spite of our correspondent's assertion, we do not believe that corruption of this kind is spreading or cannot be checked whenever it shows itself. Our reason for this belief is, that several times, when indignant architects have sent us business circulars offering commissions to them, but *professing no desire that the offer should be held "confidential,"* we have felt that the offer was made in the same spirit that it might be made to the customer himself, and in that belief have written to the party issuing the circular, explaining the delicate relationship in which an architect is placed as the fiduciary agent of his employer. In every case we have received answer that the offerers of commissions had not understood what an architect's relation to his client was, and an assurance that they would never send out similar circulars. If the offering of bribes must increase, it can only do so by the sufferance of the profession, and we have too high a regard for its members to believe that they are not both able and willing to check it. — EDS. AMERICAN ARCHITECT.]

THE RESPONSIBILITY FOR DILATORY WORK.

NEW YORK, April 22, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I have seen several answers in your paper to inquirers regarding the relations of architect and client, and as we look upon you as much as any one as an authority in these matters, I write to ask regarding a position which has lately arisen in my practice. Please let me know, in as sharply-defined lines as possible, what is the responsibility of a superintendent architect in the work of effectually hastening the progress of slow, dilatory contractors. In ordinary practice, ought he to be held accountable when the carpenter's work does not promptly meet the mason's, or *vice versa*, or when any other craftsmen are not in season for the steady progress of the building, it being pre-supposed that all contracts have been placed in proper and due season? I am superintending a work that has been unusually long in coming to a close — my client expresses a high degree of satisfaction with the purely architectural part of my service, but holds that I have been to blame that the work has been slow. The charge, as I understand it, is not of delay in giving drawings, but that I did not, with sufficient activity, use the whip with all hands, or, more properly, use language to that effect. How far, in my own opinion, I have failed in the "language part," I will not now say, except that I tried to do my best to expedite the work.

Granting that I was not successful, and that I have stood to my post for an extended period of supervision, how far have I failed in my professional duty? Yours truly, A Subscriber.

[It would be impossible to say, without knowing all the circumstances, whether "Subscriber" is to blame for the slow progress of the work. Perhaps he may have omitted to introduce any forfeiture for delay into his contracts, and the owner might justly complain of such an oversight, but, if nothing of this sort is to be imputed to him, he should not be saddled with the failure of the contractors to live up to their own agreements. Owners sometimes fancy that an architect ought to spend a good deal of time in prodding the contractors, forgetting that the architect can best serve them by a somewhat formal abstinence from interference with the contractors, except in the ways distinctly specified in the contract; and that officious directions, given without necessity in regard to matters not in the architect's province, may be construed, by a jury, always disposed to take a builder's part, as a waiver of the very provisions in the contract which the owner regards as most important. If "Subscriber" feels himself entirely blameless in the matter, and is sure that the delays were wholly due to the acts of the owner or the fault of the contractors, we will remind him that the profession considers him entitled to extra payment for the unexpected and unreasonable length of time through which he has been obliged to continue his service by superintendence. — Eds. American Architect.]

NOTES AND CLIPPINGS

What a Frenchman can do with a Hair. — Of General von Manteuffel, the late German military governor of conquered Alsace, who hated all that was French, it is said that he once, at a public dinner, engaged in a dispute with a French diplomat, who maintained the superiority of the French workmen over the artisans of all other nations. "A thing so ugly does not exist that the skill and genius of a Frenchman cannot make of it a thing of beauty," he said. Angered by the contradiction, the old soldier pulled a hair from his bristly-gray moustache, and, handing it to the Frenchman, said, curtly, "Let him make a thing of beauty out of that, then, and prove your claim." The Frenchman took the hair and sent it in a letter to a well-known Parisian jeweller, with a statement of the case and an appeal to his patriotic pride, giving him no limit of expense in executing the order. A week later the mail from Paris brought a neat little box for the General. In it was a handsome scarf-pin made like a Prussian eagle, that held in its talons a stiff gray bristle, from either end of which dangled a tiny golden ball. One was inscribed "Alsace," the other "Lorraine," and on the eagle's perch were the words, "You hold them, but by a hair." — *Exchange.*

The Fall of the Pemberton Mill. — The fire which has destroyed the picker-room and dye-house of the Pemberton Mills, in Lawrence, brings to mind the awful calamity of twenty-six years ago, when the main building of the Pemberton Mills collapsed, burying the 600 operatives in the ruins. It was about 4.30 o'clock, on the afternoon of January 10, 1860, that, without the slightest note of warning, the ceiling of the upper floor separated from the walls on either side, and in another instant carried each floor, with burdens of machinery, iron and timbers, to the bottom, where, with 600 people, a pyramid was formed, rising over 50 feet. The wall, thus freed from the internal support, wavered a moment, and, falling inward and outward, completed the wreck. The moans and cries for help of those in the ruins whose lives had not been immediately crushed out, mingled with an alarm rung out by the factory bells, called almost the entire community to the spot. Darkness lent additional horror to the scene, for, while a thousand hands were ready to rescue, it was impossible to know whence the calls for assistance came. Notwithstanding the difficulties surrounding the work, over 200 of the imprisoned were taken out in safety, beams and iron-pillars being moved about with the assistance of ropes. Communication with those of them who were uninjured was maintained for hours, and water, coffee and words of encouragement given them. Toward ten o'clock two men descended through a crevice with lanterns to rescue a young woman, when one of the lamps was broken. The burning oil set fire to the surrounding cotton, and in a few minutes the black, shapeless mass of débris was wrapped in flames. Before midnight every voice within the ruins was stilled in death. A few days after, a rough estimate of the loss of life was made, when it was found that 145 had been either crushed or burned to death, while 166 were wounded. Those of the dead who were not identified were carried to the City Hall, and there spread along the floor to await the recognition of friends, which in many cases was difficult and sometimes impossible. — *Boston Journal, April 12th.*

TRADE SURVEYS

There is just sufficient idle labor in the United States to protect employing interests from unreasonable demands of labor organized or unorganized. Each week absorbs some of this surplus, leaving the wage-workers more and more the masters of the situation. Good reasons exist for saying that the transition on Monday from ten hours to eight and nine hours labor per day will be quiet, orderly and satisfactory. At frequent periods within ten or fifteen years violent fluctuations have occurred in prices of products without any lasting disadvantage. The industrial transition which will take place on a more or less extended scale on Monday, is not regarded with as much quietude by the manufacturing interests at large, as the outside and disinterested observer. The employing interests are face to face with a new master; they are obliged to agree to many things which in the past they have refused to recognize. This week two hundred labor-organizers are initiating laborers at the rate of 10,000 to 15,000 per day. Their employers have at last aroused. Reference has been made heretofore to the movement of some manufacturers in Rhode Island and Massachusetts looking to organization. The preliminary work has been completed in those States and in other States, both in New England and in the Middle States. A spirit of organization is at work among the ranks of employers. No less than twenty organizations have been established for mutual protection and assistance. These organizations lack the elements of strength possessed by the labor unions, but they will answer for the emergency. The actuating motive at present is to guard their membership against undue advances in wages and against the exercise of undue control by the workmen over their employers and their business. These organizations of employers will shortly broaden in their scope: the history of trades-unionism on this side and on the other justify the statement. The iron and steel manufacturers in western Pennsylvania organized over twenty years ago for this same narrow, but commendable purpose of protecting their interests against the seemingly exorbitant demand of mill labor. The workmen's union was a compact one, and they were exceptionally fortunate in their struggles for higher wages, gaining nearly every strike which they made from that time to this. The result after a few years was the broadening of the employers' association, the development of a spirit of friendliness to their employés' union and the establishment of rules and regulations and a sliding-scale of wages, based upon the card-rates of iron for their future control. Many strikes have been avoided of late years because of this association among employers. When either side is dissatisfied, the rules provide for the calling of a conference of committees representing each side where complaints are discussed and friendly results arrived at. This organization of workmen grew from a small local association of less than one hundred men into one compact organization known as the Amalgamated Association of Iron and Steel Workers, and numbers between 20,000 and 30,000 skilled laborers in the nearly three hundred rolling-mills in the United States. The employers' association has also expanded into a national federation of iron and steel manufacturers, and strikes or lockouts are not thought of by either side. The interest of iron and steel mill-employés and of their employers in Great Britain are kept in harmony by some such system as this. Up to 1866 bitter and prolonged strikes occasioned sore distress on one side and serious losses on the other. Out of this grew the Board of Conciliation and Arbitration for the manufactured-iron trade of the North of England. For several years there have been no serious strikes in the region controlled by this organization. Arbitration is accepted, though not without deep complaints on one side or the other at times. In the United States the organization of labor will expand with such rapidity during the next year or two that employers will be obliged to band together at first for protection against exhorbitant demands, but ultimately for the purpose of establishing friendly relations with their workmen through their labor associations. Out of this will flow many good results; employers who have for all time been accustomed to absolute independence will not gently take to this labor control, but it is a power which will force itself into recognition. It is making no prediction to say that in a few years the larger industries will be compactly organized, and that all disputes will be settled in a friendly way by Boards of Arbitration or Conciliation, and furthermore that the profit-sharing system will gain in acceptance and will be found to produce results that will make it a welcome escape from chronic evils. Half of the difficulties in this whole question will disappear as soon as organized labor demonstrates its ability to equalize the rates of wages throughout the United States in each industry. The fear now entertained is that organization will control in isolated sections, and that the uncontrolled industrial interests will possess special advantages in consequence. Particular attention is devoted to this over-written-about question at this time, because of the universal interest felt in it on account of the impending change in the hours of labor. There are, no doubt, thousands of employers whose experience justifies them in predicting evil results, and who cannot be induced to see their way smoothly through the changes at our doors. The question is a broad one, and no one can see to the end of it. The causes at work are legitimate ones; the objective point of the army of wage-workers is an honorable one, therefore no harm can come from the movement. If the reform is not general it will fail of its own weight. There is good reason, however, for believing that in the building trades and in the bulk of the industries in the larger cities and towns the reduction will be general and permanent, and that in a few weeks confidence will be restored, that demand for all sorts of products and material will increase, and that the summer and autumn will be seasons of exceptional industrial and commercial activity. The strike fever will surely subside. The iron trade has lost some of its vigor during the past few days, so far as market indications go to show. The production, however, of both iron and steel have not been curtailed, and there are no evidences of any falling off in consumption. Railroad building this year, to date, foots up five hundred and fifty miles as against three hundred and fifteen miles same time last year. The commercial failures up to a week ago for this year were 3,814 as against 4,479 same time last year. Railroad traffic is increasing on the Trunk lines, and in some directions earnings are also improving. Moderate gains in the movement of general merchandise are reported at several Western commercial centres. The bituminous miners of Pennsylvania and Maryland are on strike to the number of about 25,000, and in the anthracite regions the apprehension is to-day that a general strike will be inaugurated for the eight-hour day, and for the correction of a number of abuses that have existed a long time. The newspapers are doing more to stimulate strikes by their sensational reports than the labor agitators themselves. All that the anthracite miners want is the eight-hour day at present. An extremely small volume of business has been transacted in the stock markets. The money-markets are quiet, business-paper discounts ruling at four and one-half to five per cent. There is no marked activity in financial circles anywhere, but an improving demand for money is likely to be developed in the West. The probabilities point to an improving trafic and improving freight rates. Returns on the Trunk lines are more satisfactory this year at twenty-five cents than last year at fifteen. An extensive movement is in progress in lumbering operations in both primary and secondary markets. Textile manufacturers are gradually restricting their operations.

The Paintings in the Pantheon, Paris, deteriorating. — An unforeseen trouble has arisen in consequence of the secularization of the Panthéon, in Paris. The splendid frescos which have occupied the leading artists of France nearly ten years, are already showing signs of injury from damp. So long as regular services were held in the Panthéon the constant influx of fresh air and the warmth generated by the congregations kept the interior tolerably dry. Now these influences are withdrawn, steps must be taken to preserve the frescos. Unfortunately, there are no existing means of warming the building, so that it will be necessary to erect stoves if the works of Puvis de Chavannes, Cabanel, Laurens, H. Levy and others are to be preserved. — *New York Tribune.*

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 541.

MAY 8, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

THE labor troubles which everybody is talking about just now have a certain interest for architects, who seem likely for the present to be the greatest sufferers by the uncertainty which prevails in the building trades. To those who can view with philosophy the abandonment of the building projects upon which their income for the summer was to depend, there is a certain pleasure in reflecting upon the singular circumstances of the movement, and in speculating upon the results of the curious tendencies of mind which are shown to prevail among the people of the country. According to the New York *Commercial Advertiser*, as quoted in the *Scientific American*, Mr. William Strange, a silk manufacturer of Paterson, New Jersey, who employs twelve hundred persons in his mills, was honored a week or so ago by a call in his office from an operative belonging to a cigar factory. The cigar-maker presented to Mr. Strange an order seriously affecting the work in his dyeing shop, and demanded that he should sign it. He declined, and the cigar-maker walked out. As he passed the dyeing shop he snapped his fingers, and in an instant all the men in the shop dropped their work and filed out of the building. Mr. Strange went to see what the matter was, and learned from the men that they had no grievance, were satisfied with their work and their pay, and were indignant at being signalled to drop both, but, as they said, under the rules of their organization they had no choice but to obey the cigar-maker's snapping fingers.

MANY stories similar to this show that a great deal of the trouble which the labor organizations are giving to those who belong to them, as well as to other people, has a moral and cause. As a rule, the men now on strike have nothing to complain of, and little to gain even by the success of their efforts. Unlike the factory operatives who took their turn at striking some time ago, they are already well paid, and constantly employed, with a prospect of still better pay in the future if they would be contented to leave the rest of the world at peace, but the craving for a yoke of some kind, with which foreign immigrants have infected the once free Americans, has become so strong as to lead even men born and brought up on Northern soil to run to thrust their heads into any halter that a loquacious liar may choose to hold out to them. To judge from the facts, three-fourths of the people of the large cities in this country hanker for a master. To give up thinking for themselves, to obey passively and implicitly, to eat, drink and sleep at some rascal's signal, is to them the ideal of happiness and virtue. It would be hard to say that there is not something admirable in this sentiment. The annals of labor struggles show that to the slavishness of obedience to foolish leaders thousands of workmen join a devotion and loyalty to their comrades which is worthy of the highest praise, and if it were not for the danger that this loyalty may be utilized before long with disastrous effect by some ambitious revolutionist, there would be considerable satisfaction in observing the growth of the spirit of fraternity here.

WE think it only fair to recognize the apparent desire to conduct an unexceptionable architectural competition, which is shown in the circular of invitation of the Kansas City Chamber of Commerce Association by calling to it the particular attention of our readers. As every one knows who has done us the honor to look over the editorial remarks which we have occasion from time to time to make on the subject of competitions, we regard such contests in general with a feeling which is composed in about equal parts of appreciation of the good which competitions, well carried out, are capable of accomplishing — both by the practice which they afford the younger men in composition on a larger scale, and the opportunity which they offer the competitors for comparing their own work with that of others — and of loathing and contempt for those swindling schemes in which, under the pretence of competition, young men are robbed of their time and money for the benefit of sharpers and fools. If it were always possible to distinguish from the outward aspects, one of these sorts of competitions from the other, we should long ago have begun the practice of illustrating by examples the difference between them, but neither we nor any one else, as it seems, can tell positively from a circular of invitation whether those who accept it will be treated as artists seeking a fair chance to show their powers, or as helpless gudgeons, who ought to expect nothing better han to be disembowelled when once they have swallowed the bait, and many of the better class of architects have, therefore, for years refused to take part in any competition whatever.

WHETHER this is the wisest course for them we will not undertake to say; but a new class of architects is now growing up in this country, composed of men who long for the fray of friendly rivalry, who feel that they learn more even by defeat than by victory, and hold the mere selfish advantage of winning very lightly, in comparison with the invigorating and stimulating exercise in their noble art which the contest itself affords to all who take part in it honorably. Such men ought to have opportunities for trying their strength beyond those which their sketch-club contests afford, and it is as unfortunate for the public as it is for them that they should so rarely find it prudent to enter a real competition. They would do so more frequently, we know, if they could be sure of fair treatment, and we are disposed to think that the time has arrived for taking the matter into their own hands, and securing such treatment, and with it the opportunity that they need, and which in all other countries is accorded to them. There are two ways in which the reform must be accomplished. In the first place, the whole body of architects who interest themselves in the subject should combine to promote fairness in the methods of carrying on competitions, and to punish conspicuously those, either in or out of the profession, who are guilty of any violation of promises, or other underhanded or dishonorable dealings in regard to any part of them; and in the second place, those who do offer acceptable terms, and keep to them, should be rewarded and encouraged by a conscientious effort on the part of the profession to give them what they wish in return. Neither of these steps is sufficient without the other, and if both are taken with decision the effect is sure. The Western Association of Architects has led the way by adopting rules in regard to the conduct of competitions which are perhaps unexceptionable, but before the members of that Association can make their rules prevail throughout the community, they must show that a competition carried out according to them produces better results than one devised in meanness and fraud. If, for instance, terms of competition so thoroughly conformed to the principles accepted by the profession as those of the Kansas City Association attract no more and no better designs than an invitation like that of the Denver Capitol Commissioners, it will not be strange if the Kansas City managers find no imitators, whatever the profession may say; but if the Kansas City invitation secures a design as noble as that of Mr. Richardson for the Cincinnati Chamber of Commerce, the profession will not need to do much urging to induce the authors of future invitations to follow the Kansas and

Cincinnati model. For this reason we hope that the circular of the Kansas City Association will meet with a full response. If there are any architects hesitating whether to enter the lists, we should advise them, so far as we can judge of the committee's intentions by its circular, to do so. If the competition is carried out with the fairness that seems to be intended, we are sure that all the competitors will be glad to have taken part in it, and, if they do their best, will feel that the strength that they have thereby gained is well worth to them all it cost, while the effort will itself help to bring them an additional compensation in the effect which it will have in promoting contests of a similar character.

WE learn that the late Mr. Richardson, before his death, had a paper drawn up in which he signified his wish that his business should be continued by Messrs. G. F. Shepley, C. Rutan, and C. A. Coolidge, who have long been his principal assistants. Mr. Rutan, who has been with Mr. Richardson about fifteen years, has, during the greater part of that period, acted as manager of the business affairs of the office, while Messrs. Shepley and Coolidge have been the most trusted draughtsmen, and Mr. Shepley in particular, who is engaged to be married to Mr. Richardson's daughter, has long enjoyed the most intimate relations with his chief. These gentlemen are perfectly familiar with all the details of the work now in hand, and there can be no question of their ability to carry it out in accordance with Mr. Richardson's intention.

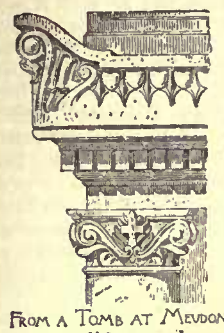
THE Directors of the Cathedral of Milan have given notice of a competition of architects, open to all the world, for designs for a new front to the Cathedral. As every one knows, the effect of the great Gothic building is now marred by a Renaissance façade, and a citizen of Milan, Signor Aristide de Togni, having bequeathed to the city a large sum of money, to be applied to the reconstruction of the façade in a style corresponding with that of the rest of the building, it has at last been decided to undertake the work. No limit is set upon the cost of the alteration, architects being free to adopt whatever disposition may be, in their judgment, best adapted to suit the historical and artistic renown of the Cathedral, provided only that the design conforms to the style and material of the remainder of the structure, and to the spacing of its nave and aisles, and that the new front is not brought out so far into the Piazza as to interfere with traffic. The designs must be sent, under motto, to the Directors of the Cathedral, before April 15, 1887, and will be judged by a jury consisting of one Director of the Cathedral, who will preside over its deliberations, a member of the clergy, four architects — one French, one German, one English, and one Italian — to be chosen by the Academia delle Belle Arti of Milan; a painter, a sculptor, and an architect, chosen by the Municipality of Milan; a Fellow of the Royal Lombardy Institution of Science and Literature; an architect chosen by the Commission for the Conservation of Monuments in the Province of Milan; and two architects, one painter and one sculptor, to be chosen by the votes of the competitors. After a public exhibition of the competing designs, the jury will select from ten to fifteen, the authors of which will be invited to enter into a second competition. In the second competition a prize of ten thousand dollars will be given to the author of the design considered worthy of execution, on condition of his preparing a model and detail drawings; and three other prizes of one thousand, six hundred, and four hundred dollars, will be awarded according to merit. Further particulars may be obtained from the official circular of instructions, published by U. Hoepli, bookseller, Milan.

SOME of the troubles incident to the occupation of new buildings have shown themselves in the London Law Courts, and have called forth renewed criticisms of that noble but unfortunate piece of architecture. Not long ago the ventilating-apparatus of the Queen's Bench Court was seized with some unexplained malady, which showed itself in the discharge from the registers of an immense quantity of black flakes, which rained down so copiously over desks, books and papers, that the business of the court was suspended until the shower had subsided and the desks and papers were dusted off. About the same time, a sitting of the Vice-Chancellor's Court was suddenly interrupted by the dropping of some incandescent-light bulbs upon the heads of the lawyers below. The proceedings were stopped, and the engineer was summoned, when it was discovered that the bulbs had been attached with screws of too small size. The remaining lights were examined, and several other loose bulbs were removed, in time to prevent them from disturbing the court. The bulb of an incandescent light is not usually very hot, and its impact on one's head would not be attended with the danger incident to the fall of the melted copper which has sometimes been known to run from arc-lights, but it must be startling, at best, and we can quite sympathize with the learned barristers who think it possible to have too much of modern science about them.

THERE is something very interesting in the enthusiasm with which the French are at present applying themselves to the education of their children. Not only in manual and technical training, but in artistic and intellectual development, they seem to have determined that their children shall be superior to themselves, and the Government and people work together to build new schools, and to fill them with pupils. At the moment, the work in hand seems to be best promoted by the construction of schools accommodating a large number of children, and these great establishments follow each other in rapid succession. One of them, the Lycée Janson de Sailly, has been finished a little more than a year, and the technical journals are still occupied with descriptions of it, yet it already contains nine hundred and fifty pupils, leaving only fifty vacant desks. Three others in Paris, even more recently completed, are full almost to overflowing, and the Government has lately undertaken the establishment of a number of great suburban schools, both to accommodate the population of the outlying villages, and to relieve the city schools, by taking from them the children whose parents prefer to pay the expense of sending them every morning a little way into the country, for the sake of the fresh air about the suburban schools. The last of these, the Lycée Lakarel, has just been opened at Sceaux, a pretty village twenty minutes' ride to the northward from Paris. Like the others, it is designed on a great scale, the total cost of the building, without the land, having been more than a million and a half of dollars.

ACCORDING to *Le Génie Civil*, which gives plans and elevations of the buildings, the arrangement, which is due to M. de Baudot, a friend and disciple of Viollet-le-Duc, and now Government architect, seems to be remarkably simple and sensible. Some idea of the size of the establishment may be obtained by reflecting that the outside walls of the main building alone, if brought into a straight line, would occupy a length of about a mile and a quarter, while the shortest route from the chapel at one end of the building to the infirmary at the other is two thousand feet long, a covered corridor extending the whole distance. The main portion of the structure consists of a long, narrow building, containing, on the ground floor, class and study rooms. From this project five wings, two of which contain additional study and class rooms, while the middle one contains the entrance, vestibule and reception-rooms, and the remaining ones the refectories and kitchens. Between these wings are four playgrounds, separated by the masses of the building and shut in by walls. One of these, after the usual French method, is appropriated to the larger children, the next to the *moyens*, or middle-sized ones, the third to the small ones, and the last to the *minimes*, or babies. Each playground has its *préau couvert*, or shed for games in rainy weather, to which is added a gymnasium for the older boys. In front of the building is a large lawn for military exercises. In the second and third stories, over class-rooms, are dormitories for about six hundred boarding pupils, besides class-rooms and library, and the space over the reception-rooms is occupied by the apartments of the steward and manager. A little infirmary, with beds for twenty sick children, terminates one end of the block, and a pretty chapel, in a style quite characteristic of the architect, occupies the other. The details of the interior work are such as to allow of thorough cleanliness. The refectories, in particular, are paved with tiles, and are wainscoted more than three feet high with rough plate-glass. The glass is in plates, six feet by three, and half an inch thick, and is painted on the side next the wall. The lower edge of the plates rests in an angle-iron secured to the wall, and the upper edge is held by a strip of iron bolted to the wall, so that any plate may be removed if desired. Above the glass is a belt of enamelled brick, and the wall above is painted in oil. The whole room can thus be washed with a hose, without injury to any part of it, and even the tables are of white marble, while the benches are of oak.

BANDELIER'S MEXICO.[1]



FROM A TOMB AT MEUDON M. BOUSSARD ARCHT

MR. BANDELIER appropriately terms his valuable volume recording his observations in our neighboring republic, "an archæological reconnoissance into Mexico." The time which he spent there would hardly admit of exhaustive research in any one field, but he looked over the land very thoroughly wherever he went, and did some excellent investigation. With his customary methodicalness and nice attention to detail, he gives the lay of the land very closely, so that his reconnoissance will prove invaluable to any one proposing to enter upon the rich field which Mexico offers for archæological and ethnological explorations. There is but one bit of carelessness to be noted, and that is an error so obvious that no one would think of accusing the author of anything more than an oversight in examining his proofs: On the first page, the Sierra Madre Occidental is spoken of as entering the State of Tamaulipas almost due east of Tampico. As Tampico is a port on the Gulf, of course the opposite point of the compass is intended. Few men are better equipped with well-stored and arranged historical material for Mexican work than Mr. Bandelier, and it is a matter of regret that circumstances have not allowed him to settle down in some one spot and pursue thoroughly some one line of work according to the true modern ethnological method, as carried out by Mr. Cushing at Zuñi, and by himself later on among the pueblos of the Rio Grande. There are immense opportunities in Mexico for labors of this kind, and much light would undoubtedly be thrown on many points about which science is now totally in the dark, or has reached no farther than the twilight of conjecture may enable it. Probably no one is more conscious of this than Mr. Bandelier himself; therefore we do not propose to follow the too common method of criticising his work for what it is not and does not pretend to be.

Part I of his book, "From Tampico to the City of Mexico," is based mainly on superficial observations made on the regular tour to the capital by steamer from New Orleans to Vera Cruz, and thence by railway. Here Mr. Bandelier's historical studies come into play, however, and he succeeds in giving a good picture of the present ethnic distribution as compared with the conditions and relations of the various lingual divisions of the aborigines at the time of the Conquest. He shows the striking changes that must have taken place in the ethnography of the region south and southwest of Tuxpam since the Conquest; for instance, the large pueblo of Papantla is now exclusively Totonaco in language, while about 1571 or 1572 the Nahuatl tongue was spoken there. Mr. Bandelier was unfortunately compelled to abandon his project of visiting the various remarkable ruins in the neighborhood of Pepantla, on account of a severe attack of illness, but from the few descriptions and pictures of them which he had seen they seemed to reveal a style of architecture perhaps more closely allied to Yucatan, Tehuantepec and Cuernavaca, than to that of Mitla and the Central Valley.

Mr. Bandelier notes a certain structural peculiarity of native habitations in the houses on the coast, where each family has often two and three houses; and, in case there is but one, it is so subdivided as to correspond to the three buildings. This three-fold division Mr. Bandelier afterwards found prevailing generally in Mexico. The dweller on the plains of the table-land concentrated his rooms in one building, while in the Sierra the mountaineer, like his brother of the coast, made of each room a distinct building. These three classes are distinct, not only in their uses, but very often in the material out of which they are made. When in separate structures, they sometimes stand all in one enclosure; but they are also often scattered, so that two stand on one lot, and the other on another. The *sala* (*teopantcintli*, little place of God), contains the family altar and pictures of the Virgin and Saints. It is seldom inhabited, being the spare-room, the gala-room, the place of reception, of family worship, of festivals. The kitchen (*cocina* or *tezcalli*, house of the one who grinds on the *metate*, or hand-mill), contains the hearth and apparatus for cooking. Unless a stranger is present, meals are taken there. The family sometimes sleeps there, but frequently in the storehouse, which is the third of the group, called in Spanish *troje*, and in Nahuatl, *cencalli*, house of ripe corn.

In speaking of Tlaxcala, the State which played such an important part at the time of the Conquest, Mr. Bandelier protests against the misconception of aboriginal institutions by which it has been "palmed off as a kind of Mexican Switzerland, as a free republic in the midst of despotically ruled communities:" he states that there was not the slightest fundamental difference between the social organization and mode of government of the Tlaxcaltecos and of the Mexican tribe, and he pronounces it an utter mistake to look for a parallel of the wars between them and the valley tribes, to the campaigns of Xerxes against the Greeks, or to those of Charles of Burgundy against the Swiss. "In order to understand them, a study of the Conquests, or rather devastations, by the Iroquois in the seventeenth century, will furnish the best material."

Part II is devoted to archæological notes about the City of Mexico. The so-called calendar stone Mr. Bandelier agrees with Don Alfredo Chavero and Dr. Valentini in calling "The Stone of the Sun," the latter gentleman having established its history and name. Mr. Bandelier devotes considerable attention to several of the principal antiquities in the National Museum.

Part III describes the author's investigations about the site of the former pueblo of Cholula and its vicinity, which he selected as a field upon the advice of M. Désiré Charnay, who was in Mexico at the time. Cholula is on the opposite side of the great volcanoes from the City of Mexico and very near their bases. In describing the region, and mentioning the spot in the higher timbered regions where the conquerors enjoyed that first glorious view of the valley and the lakes which Prescott described so graphically, Mr. Bandelier takes good opportunity to say: "His picture of it, however inimitable, barely does justice to the extent and beauty of the scenery, so far as nature is concerned. But he might have omitted the lament over the subsequent changes. Those changes, even as regards the picturesque alone, have certainly been improvements. Even admitting that the population may have decreased since the Conquest, the change from primitive horticulture to intelligent agriculture, and the introduction of new plants, as well as the change in architecture, have increased instead of lessening the beauty of the scene. The City of Mexico, with its domes and spires glistening in the noonday sun, is certainly a finer sight than was the old pueblo, resting on the dull waters of the lagoon like an adobe patch surmounted by the clumsy mounds of worship." This is well said. It is time justice was done the Spaniards, who have been accused of turning the country into a barren waste, and the impression prevails that Mexico is to-day a treeless land through their work, whereas, in truth, the natural conditions make the tree-growth of the table-land scanty below a certain altitude. The lofty mountains about the valley are still densely covered with pine forests. The "Spanish hatred of a tree" is probably a myth. The Spaniards certainly did much, as the records show, to improve Mexico in this respect, by the introduction of new species.

Mr. Bandelier gathered much valuable information in Cholula, and made careful measurement of the great mound, or so-called pyramid, of which Mr. Jackson, the Denver photographer, has given us the most beautiful and artistic view extant. (See gelatine-print reproduction in Imperial edition.)

Mr. Bandelier made some interesting studies of native domestic architecture during a several days' stay in the pueblo of Cuahtlantzinco, whither he went to copy certain aboriginal paintings there preserved, but was received with distrust by the inhabitants, and was not allowed to see the pictures, which they carefully concealed from him. Had he known at that time, as he probably knows now, the dread of sorcery universally prevailing among Indians, he would doubtless not have been so severe on them for their "stupidity and treachery," for from their own standpoint they were taking wise precautions. Such obstacles can only be overcome by living long and intimately with a people, and thus securing their confidence.

The fourth and last part of the book describes an excursion to the noble ruins of Mitla, in the State of Oaxaca. M. Charnay had been investigating Teotihuacan and Tula diligently, and the same sense of honor which kept Mr. Bandelier away from Zuñi, until he found an opportunity to visit it while Mr. Cushing was there, although near by in New Mexico during his absence, caused him to avoid a visit to those interesting spots and turn to Mitla, though far distant in the south. There, and in several other parts of Oaxaca, he did some admirable work in his characteristically exact way. Much of this is of particular interest architecturally, and the heliotype reproductions of photographs of these Mitla ruins, and of other features described in his account of previous investigations, give a good idea of their character. There are, besides, numerous illustrations reproduced from the author's drawings of details of construction, plans, etc.

It strikes us that Mr. Bandelier may be in error in looking too closely for evidences of the communal theory to which he is devoted; in seeking a savage origin for everything, he may be led somewhat to depreciate the real achievements of the various sedentary races which inhabited this continent. These had attainments which it seems hardly possible could have developed themselves from a condition as low as that of the ordinary North American savage. In view of the great antiquity of man, and the probability of great geological changes in comparatively recent, though prehistoric periods, it is not unlikely that many of the customs and attributes of American races are inheritances from a time when continental outlines were very different from the present ones, and certain Asiatic and American races were one people.

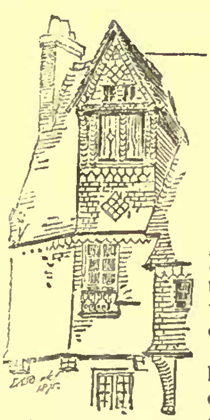
Mexico, as we have said, offers an immense field for ethnological studies, such as Mr. Cushing has given the best example of in his work at Zuñi. Even in places like the Indian villages around the city of Mexico, where Nahuatl is the common tongue, great results might be thus obtained, and in no other way, for it must be borne in mind that wherever the native tongue has been retained, the old customs, traditions and histories have been secretly retained also. The Spanish civilization has overlaid and buried this, and not destroyed or absorbed it, just as a later geological formation overlays an older, with the story of its period recorded on its rocky pages. To pursue a course of study in Mexico under such conditions would in some respects be an easier task, and in others more difficult than that of Mr. Cushing at Zuñi. The physical hardships would not be so great, but, owing to the intermingling of Spanish civilization and the influence

[1] *Report of an Archæological Tour in Mexico in* 1881. By A. F. Bandelier. Papers of the Archæological Institute of America. American Series, II. Boston: Published for the Institute, by Cupples, Upham & Company, 1885.

of the Church, the purpose would have to be more completely concealed and the work carried on by one probably living ostensibly on the ground for quite another object. His real work would, in other words, have to be quite esoteric in its method, and to gain the confidence of the natives under such circumstances would be quite a delicate task. Could one, however, once gain access to a wild people like the mountain Mayas of Yucatan, Mr. Cushing's lines might be closely followed, and what treasures might not be revealed from intimacy with a people who doubtless know the history of ruins like Palenque and Uxmal as accurately as the Zuñis know that of the numerous ruins left by their progenitors over New Mexico and Arizona!

Sylvester Baxter.

CONCRETE.[1] — II.



Slate covered Dormer Harvre: France.

HITHERTO I have spoken of concrete as used for foundations only, but there are many other purposes for which this material can be employed. I suppose it is not much more than twenty years ago that building materials and labor, being at a very high price and by no means of very high quality, the idea began to gain ground that concrete might be used for the walls of buildings. I have already alluded to the fact that the Romans used it for these purposes, and that, too, although they only had lime, whereas we have Portland cement. But the mixing of the pozzolana, which I have previously mentioned, with the lime, gave it many of the characteristics of a cement.

The Italian architect Palladio, writing three hundred years ago, gives a very good account of the Roman method of wall construction. He says: "The ancients used to make walls called *reimpiuta, i. e.*, filled up with rugged stones, which is also called coffer-work, taking plants and planting them edgewise in two rows, distant from one another the thickness of the walls and filling the space between them with cement, stones of all sorts, earth and mortar mingled together, and so on from course to course." This method of using concrete for walls is called monolithic, the concrete being simply poured, in a semi-fluid state, into the position required, to which it is confined by boards, and it sets in that position, so that the whole of the wall is one compact homogeneous mass. Another method is to form slabs of concrete by casting it in moulds and allowing it to set there, and the slabs are then taken out of the moulds and carried to the place required and used in the ordinary way, just like bricks or stone. The former system, if only ordinary care be taken, makes undoubtedly the strongest work, as there are no joints, either vertical or horizontal, and, moreover, no skilled labor is required in this construction, ordinary laborers being able to mix the ingredients and fill in as required. Several systems of apparatus have been invented for confining the concrete to the requisite thickness of wall, and for shifting the moulding boards from one stage to another, and many of these are of somewhat complicated character, but it is very doubtful if any material advantage is gained over the simple plan of nailing the boards to the upright posts and filling-in between. Walls thus constructed are really stronger than brickwork, drier and more cheaply built, but great care must be taken in the preparation of the concrete; the cement must be of the best, the aggregate must be broken to the proper size, and the whole thoroughly well mixed. If these precautions are taken, the thickness of the walls may be about twenty per cent less than with brick.

The Metropolitan Board of Works, after long deliberation, have at length announced their intention of recognizing the use of concrete as a building material for walls in London, and to place the following restrictions on its use, viz., that the proportions shall be one part of cement, two of sand, and three of coarser materials, which may be ballast, gravel, broken bricks or stone, or furnace clinkers, but the coarser materials are to be broken small enough to go through a two-inch ring. The walls are to be of the same thickness as brick walls, and to be carried up between parallel frames, and the District Surveyors are to see that the regulations are properly carried out. I think these regulations too strict as to the thickness of the walls, and as to the proportion of cement, particularly as extensive ranges of buildings have been put up in Southwark, where the cement was gauged eight to one. I rather pity the District Surveyors in their work of supervision, but the Board seem to have missed the most important point of all, viz., the quality of the cement; and they certainly ought to give their officers power to test this, for, as I have pointed out, serious consequences will ensue if this be not of the best kind.

The second or block system has, however, some advantages: no particular building apparatus is required; any imperfections in the concrete can be discovered before it is used; the blocks can be made of any required section and of any size; and permanent tints can be given to the blocks by mixing various mineral coloring matters with the aggregate in the moulds. But for laying these blocks just as much skilled labor is required as is the case with bricks or stone, and of course mortar or cement must be used to bed the blocks in; in fact, this is merely using artificial blocks of stone instead of natural ones. But this artificial stone is really concrete, and as such it possesses virtues which may be sought in vain in any of the natural building stones, and therefore no lecture on concrete would be complete without a reference to the artificial concrete blocks, which are very extensively used at the present time. I believe the first artificial stone which was used in this country was Ransome's, which was patented in 1844 or 1845. This consisted of a mixture of sand, silicate of soda, powdered flints, and a little clay which was worked up to the consistence of putty, pressed into moulds, dried and burned, and this burning, in my judgment, takes this material out of the category of concrete stones. Some years later, however, Mr. Ransome found that by dipping the moulded mixture into a bath of chloride of calcium the burning could be dispensed with, and a series of experiments made in 1861 by Professor Franklin showed most conclusively that Ransome's patent concrete stone, when only a fortnight old, was equal to the best of the natural stones. Soon after Mr. Ransome's first patent, in 1847, a Mr. Buckwell obtained a patent for "Granitic Brescia Stone," which, I believe, was used in 1851 in the Hyde Park Exhibition. This was essentially a concrete, as it consisted of fragments of suitable stone broken into small pieces and mixed with cement with a small quantity of water, not more than enough to bring it to a damp state; this was put into a mould and powerfully compressed with a percussive action, additional materials being added until the requisite thickness of block was obtained. The block was thus rendered very dense and compact, and this artificial stone was used for water-tanks — than which can be applied no severer test of the qualities of an artificial stone. At the present day the artificial stone which is most used is the well-known Victoria stone, the patent for which was originally obtained by a Mr. Highton. The aggregate of which this stone is composed is ground Leicestershire syenite, a species of granite containing hornblende instead of mica, and lacking quartz, which is thoroughly washed so that no earthy particles remain, and an ingenious machine has been patented for doing the washing business. After being washed, the aggregate is carefully mixed with a certain quantity of Portland cement of the very best quality, and is placed in iron-lined wooden moulds which are filled to the top, but no pressure is applied; after the concrete is set it is taken from the moulds and placed in a bath of liquid silicate of soda, and after ten days' immersion the block becomes so thoroughly impregnated with silica that nothing but the strongest acids will free it again. The stone thus becomes intensely hard and quite impervious to weather action; in fact, its hardness increases with time. This property makes it invaluable for copings, sills, paving, etc., and it has another advantage over ordinary stone, that heads and sills can be cast in as long lengths as are desired, thus avoiding joints. It is used also for sinks and other such purposes. The silica used in the manufacture of this stone is obtained from the Farnham stone found under the Surrey chalk beds, which is boiled in coppers with caustic soda.

One of the most enterprising modern pioneers in concrete building was the late Mr. W. H. Lascelles, of Bunhill Row, who was a most sanguine believer in the future of this material. Mr. Lascelles actually built cottages which were not only habitable but comfortable, the walls of which were only one and one-half inches thick, formed of slabs of cement concrete, the outer side cast in imitation of brick or tiles, and the inner side left rough for plastering. These very thin walls appear to have kept out the weather perfectly, but moisture condensed upon the inner face, so Mr. Lascelles improved upon his original idea by having a double casing of slabs with a cavity between. He also formed floors of concrete, window-frames, and roofs, but the latter did not turn out very successfully, as there was always a certain amount of shrinkage. This system did away almost entirely with the use of wood, and consequently the houses so built were as near being fire-proof as possible.

Mr. Lascelles's concrete is composed of four parts of powdered coke and one part of cement mixed together in a mill, with a small quantity of water, and cast in moulds without pressure, and by mixing metallic oxides in the form of powder with the cement the concrete is colored any desired tint. Very excellent specimens of mullioned windows, chimney-caps, heads and sills, strings, copings, panels, and over-mantels are made in this material, and are largely used as a substitute for stone, and it is much cheaper than stone, but I am bound to say I have seen cases where the color has not been retained as it ought to be, and I am informed that this is caused by the workmen giving the slabs a top dressing of colored cement after they come out of the moulds. Of course this should never be done, as the color should really penetrate some depth into the mass of concrete. For standing a London damp and smoky atmosphere, there can be no doubt of the great superiority of this concrete to almost any natural stone. Messrs. Lascelles also make a very good wall on what is termed Potter's patent. In this a casing of concrete slabs, of which one face is fine, is put up and ordinary concrete filled in between, just as in the way I described with the wooden framework; but as the slabs are intended to remain, they are formed with a key, so that when the core of concrete sets it is quite impossible for the skin of slabs to move. Among the numerous purposes for which this material is used may be mentioned silos, water-tanks, sewer-pipes, columns, etc.

It would occupy too much time were I to attempt a description of all the methods of concrete construction that have been invented, such as Hall's, Drake's, and others, but the most recent of these —

[1] By Mr. John Slater, B. A., being the fifth of the present course of free lectures to artisans at Carpenter's Hall, London, delivered on March 17. Continued from No. 539, page 203.

the system patented by Messrs. West — has various novel features about it which deserve attention. This, like Potter's system, is a slab construction filled-in with rough concrete, but the form of the slabs is ingeniously arranged so that no temporary tie or external support is required during building. The slab itself is made of concrete cast in a mould, so that on one side is a finished face, plain or ornamental as the case may be, and on the other a sunk panel about half the thickness of the slab itself, with its edges undercut, so that when in position, and the mass of semi-liquid concrete is poured in, the slabs are securely keyed to the general mass. Dovetail mortise-holes are also formed on the top and bottom edges of the slabs, in order that when laid they may be kept in their proper place by simply pouring into these holes some quick-setting cement. There is also a narrow groove along the edges of the slab, which, when filled with cement, acts as a joggle-joint, keeping the slabs together. An inner and outer casing of slabs is thus set up, and the plastic concrete poured in, filling up the sunk panels, and making with the slabs a perfectly solid wall.

For openings, jambs are moulded having recesses or dovetail holes, into which the fluid concrete may penetrate, so that they can be thus keyed to the general mass of the wall. The slabs are made either rectangular or hexagonal on plan, and as they are all cast in a mould, there is, of course, not the slightest difficulty in arranging for circular work, splayed angles, or anything of that kind. There has always been considerable difficulty in arranging for moulded or enriched string-courses or projections with concrete, and this difficulty is proposed to be overcome by casting the moulding first and then applying it to the slabs while they are in a plastic state, the moulding thus becoming part of the slab, which is then fixed in the required position. The moulds for casting these slabs are made of metal and lined with india-rubber. Similar slabs can be moulded with curves for constructing domes, and ceiling-slabs can be made with rebates, so that they can be supported on the joists or girders. This system of concrete building is certainly the most scientific and the most complete that has yet been invented, and I have no doubt whatever that a building thus erected would be perfectly dry and very strong; but I am somewhat disposed to think that the system is a little too complicated to be cheap, as the labor required for properly setting the slabs in place and cementing them together would nearly equal that required for a stone wall. The inventors have, however, shown so much skill in maturing their designs and providing for all difficulties, that it is quite possible they may soon be able to point to actual works carried out on this principle, and to give accurate details of cost, which I am not able to do now. A very ingenious travelling scaffold and concrete elevator have also been invented by Messrs. West, which obviate the necessity of erecting a scaffold all round the work, and require no putlog holes to be left, and undoubtedly some such arrangement as this has been a great desideratum as an auxiliary to concrete construction. There can be little doubt that this system of concrete building would be of most material use in the construction of farm buildings, cottages, etc., in country districts far removed from railways, as the slabs are light and portable, and the material for the filling can generally be obtained on the spot.

For paving purposes, concrete is of course excellently adapted, but it is very difficult to get ordinary workmen to lay a concrete floor properly. What they like is to lay the concrete and let it get hard, and then finish off the top with a thin coating of neat cement. This looks very well when it is first done, but sooner or later the thin coating begins to flake off or crack, and looks very bad. The proper way is to break up the materials of the concrete to a small size, and then, in laying it, to trowel it off on the top as smooth as possible, so that it is all one mass and no layers exist. Portland cement should always be used, and, if ordinary care be taken, there is no reason why a laborer should not lay an excellent concrete floor. There are many patents for concrete paving, of which I may mention Drake's granitic concrete and Macleod's granitic, which has been largely used in the north of England for warehouses, stables, etc. It is not cast in blocks, but laid *in situ*, and it can be made to take somewhat of a polish if desired. This forms an extremely hard impermeable pavement, and it looks very well, but I really believe the whole secret of the excellence of these patent systems of paving lies in the careful manipulation of the materials and the sparing use of water. I may state here that for engine-beds concrete is, in many respects, far superior to stone, and it is not liable to chip and crack, and it is very much less expensive.

I now come to the last division of my subject, and that is the use of concrete for vaults and in fireproof construction. Every one is acquainted with the fact that an ordinary arch exerts a thrust which has to be counteracted, or it would soon push out its abutments. A concrete arch, however, after it has set, forms a completely homogeneous mass, and exerts only a dead weight on its supports. The Romans were aware of this, and constructed the boldest and most extensive vaults of concrete, as in the Baths of Caracalla and the House of the Vestals, lately excavated. They were careful, moreover, to make the concrete used for these purposes of lighter materials than that employed for wells or pavements. The great dome of the Pantheon was constructed entirely of concrete of varying thickness, and the walls supporting this enormous mass were twenty feet thick. In the House of the Vestals the whole of one of the upper floors, about twenty feet in span, consisted entirely of a great slab of concrete fourteen inches thick, merely supported by corbels projecting from the walls, and in the Baths of Caracalla there are still extensive remains of large concrete vaults. We, in this country, have not yet obtained satisfactory evidence of the safe span and thickness of a concrete vault, but the material is very largely used to form small arches for fireproof floors. Is is quite impossible to treat the very important question of fireproof buildings fully at the fag end of a lecture; the subject demands a whole evening to itself; but whatever system of fireproofing be adopted concrete will prove to be the most important element in it. Whereas, the opinion used to be held that iron girders and columns as supports to a building were sufficient to make it fireproof, we have been taught by sad and costly experience that this is very far indeed from being the case. In the United States and in France they are much more particular than we are in this matter, and in the former country it is laid down as an incontrovertible maxim "that no building can be fireproof unless all constructional ironwork be protected," and no better material can be found as a protective than concrete. Stone is utterly valuless in this respect, as it will crack when heated, and give way without any warning whatever. Fox & Barrett's system consists in filling-in concrete between wrought-iron joists, the concrete being supported on fillets of wood placed about one-half inch apart, and resting on the bottom flange of the iron joists, the underside of the wood fillets being plastered. Either the concrete is carried up the requisite height and forms the floor, or if a wooden floor is required, small joists cut to a dovetail section are imbedded in the concrete and the floor-boards nailed to them. Dennett's system is almost exclusively a concrete construction, consisting of concrete arches supported next the walls on projecting courses, and by rolled-iron joists at intermediate points. In this system gypsum is mixed with the Portland cement to form the matrix, as experiments have shown that this substance can be heated to whiteness and then suddenly cooled without being injuriously affected. In Hornblower's system the iron girders are surrounded by concrete, and enclosed in a fire-clay casing supporting fire-clay arches. Even concrete arches supported on triangular-shaped wooden joists, form a floor which is very largely fireproof. If iron columns are used, a temporary wooden casing should be erected round them, leaving a space of about two inches, which should be entirely filled up with Portland cement concrete, and if a fine face be desired this can easily be obtained by cementing the concrete. Messrs. Lindsay have patented two systems which comprise the use of steel decking, as it is called, and concrete arches, the girders being entirely covered with concrete both at top and bottom. The concrete used by this firm is very light; it is called pumice-concrete, and is composed of washed coke-breeze and sand mixed dry, and Portland cement of the very best quality. It is, of course, self-evident that if you get sufficient adhesiveness and transverse strength the lighter the mass of concrete is for upper floors or vaults, the better, as so much less weight is thrown upon the supporting walls or columns. The steel decking for this kind of floor is of peculiar shape, and the system is a novel one, and appears to me likely to prove of great value for buildings of considerable size, where girders are a necessity for supporting upper floors. These girders may be described as truncated equilateral triangles, set alternately on their bases, and the truncated vertices riveted together at their sides, and forming a series of hollows and elevations. They are constructed of rolled steel about one-half inch in thickness, and their depth need not be much more than half that required for an iron girder. When the weights required to be supported are not very heavy, a combination of these steel girders, with ordinary rolled joists can be adopted. The iron joists can be placed about fourteen feet apart, and from the steel skew-backs riveted to the joists arches of concrete can be turned on centering. There is a possibility with concrete floors that will withstand any ordinary strain, that the sudden fall of anything like a huge iron safe might break through the floor, and in order to avoid any risk of this kind, Mr. Lindsay runs steel wires through the joists, the whole length of the floor, before the concrete is filled in. These are about eighteen inches apart, and are strong enough to hold up any exceptional weight that may by accident come upon the floor. In addition, these steel wires form a sort of nucleus round which the concrete sets. The total weight, girders and all, of these latter floors is considerably less than that of any other system of fireproof construction, and they are also extraordinarily strong. At one of the latest tests of these trough-girders where the thickness of metal was five-sixteenths of an inch only, a load of fifteen tons was applied in the centre of a ten-foot bearing without causing fracture. And this test was but a confirmation of previous ones, so that I feel sure these girders will supply a long-felt want. They are being used largely in the construction of the new National Liberal Club by Mr. Waterhouse.

I have now endeavored to bring before you some of the purposes for which this common material, concrete, is adapted. Its use is extending daily, and in that extended use lies a danger which it behoves us all to guard against: whether we are employing it for floors, for pavings, for walls, for vaults, for architectural enrichment, or what not, it cannot be too strongly insisted upon that scamping of every kind must be avoided; that the quality of the Portland cement used in its manufacture must be of the very best; and that no labor in manipulation must be spared, for if inferior materials be used, or carelessness in working, the results are sure to be disastrous, and grave discredit will be thrown upon a most useful building material. The subject is a sternly practical one, and it has been impossible to illustrate it by elaborate and beautiful drawings, but at least we can

learn one lesson from it, and that is, the great, the incalculable value of thoroughness in all the work which we have to undertake. As I commenced by referring to the Roman builders, so I would conclude by pointing to them again as a model for us. Depend upon it, when they were building the walls of these edifices which are still the wonder of the world, they gave no thought to what posterity would think of them; they simply did their work in the best way they knew of, and spared no pains to make it good, and if we imitate them in this, we shall all, whether architect, builder, or artisan, have the satisfaction of feeling that we have done some bit of good work, and although it is not given to us all to be great artists, and to witch the world with noble buildings, we can at least put our whole heart into everything we undertake, and we shall thereby display the truest genius, which has been described as an infinite capacity for taking pains.



[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE PYRAMID OF CHOLULA, MEXICO.

[Gelatine Print, issued only with the Imperial Edition.]

SEE article on "Bandelier's Mexico" elsewhere in this issue.

HOUSE OF COMMODORE C. A. ZIMMERMAN, RICE PARK, ST. PAUL, MINN. MESSRS. HODGSON & STEM, ARCHITECTS, ST. PAUL, MINN.

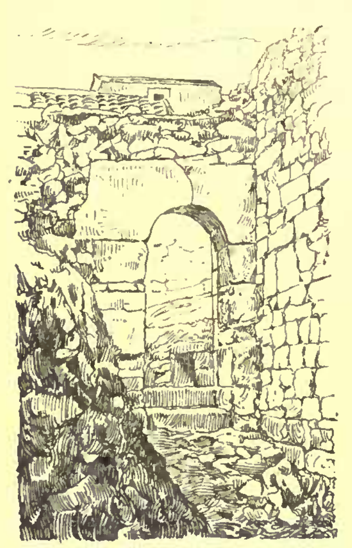
THIS house is built of Bayfield brownstone, terra-cotta brick 1½" x 12", and terra-cotta trimming; rough red Moorish tile, copper gutters, and down-spouts.

SKETCHES AT ST. JOSE, CAL. BY MR. J. A. JACKSON, WATERBURY, CONN.

UNITED STATES COURT-HOUSE AND POST-OFFICE, MACON, GA. MR. M. E. BELL, SUPERVISING ARCHITECT OF THE TREASURY DEPARTMENT.

GALLERY IN THE COURT-YARD OF THE MUSEUM AND LIBRARY, ALGIERS.

ART IN PHŒNICIA AND CYPRUS.[1] — V.



Postern in the Wall of Eryx. From Salinas. Outside View.

THERE was no such thing as an inland Phœnician city or an unfortified one. Alike at home and abroad the town was always maritime, and was always protected by strong defences. Tyre, with its fortifications, has utterly disappeared from the face of the earth; — only beneath the level of the sea can still be found some slight traces of foundations which once supported a projecting quay. At Arvad and at Sidon some remains of the ramparts still survive; but to find any really extensive relics one must look to Banias, which lies about twenty-five miles north of Arvad. Here there is a wall of defence, some six hundred and seventy yards in length, ingeniously planned with re-entering angles and bastions to protect the high ground within. It is now from sixteen to thirty-six feet high, and from sixteen to twenty-seven feet thick, built without mortar and with very rough units; with great care taken to preserve the horizontality of the courses, but with none to avoid coincidence in their vertical joints. The same mechanical characteristics mark the remains at Arvad, too. At Cyprus traces of similar sorts are unimportant, but in Sicily—at Eryx—are huge remains of ramparts, which, although reworked in their upper portions, show clear Phœnician traces below — not only in the masons' marks which have been found upon the stones, but in the method of their construction, too. About eleven hundred yards of the rampart remain — a curtain about eight feet thick, broken by boldly-projecting rectangular towers. In these towers some of the stones are very large, and the depth these prescribe for the respective courses is maintained by building up the spaces between them with smaller stones. Such walls, as our author observes, hold a mid-place, in respect to treatment, between "Cyclopean" masonry with its polygonal units, and the perfect masonry of the Greeks, with its carefully squared and uniform blocks. A postern in one of these towers still preserves a gateway, of which the arched top is very curiously formed. On the exterior face the arch is cut bodily out of two large blocks, but on the inside it is corbelled out of four stones, with a fifth serving as a lintel. On the African coast are other Phœnician settlements, of whose fortifications a portion still survives, while at Carthage an idea of the grandeur of the early fortifications may be gained from the remains which Beulé unearthed at Byrsa (the citadel), under a deep layer of ashes, witness to the conflagration lighted by the Roman torch.

The substructure of the walls is formed partly of the live rock, and contains small chambers in its thickness, with a connecting corridor between them. Above, the wall seems to have been about thirty-three feet in thickness, and above again, out of the reach of assailants, it is believed there was another series of similar chambers. This is of course but the baldest summary of M. Perrot's description, based on Beulé's facts, and on the accounts of ancient authors. He believes that the lower chambers were cisterns.

The remains of Phœnician towns are even slighter than those of their defenses. In certain parts of Carthage, as we know from history, the houses were six stories high and the streets so narrow that the Romans threw bridges across them and advanced from block to block along the house-tops. These towns were seaports, as has been said, but they were manufacturing centres also. There is a curiously modern and familiar sound about Strabo's words when he speaks of the many factories and dye-works at Tyre as "taking away from its advantages as a place of residence." Outside, in the suburbs, must have stood those residences which the people of other nations spoke of with so much admiration — used, indeed, as standards of comparison. Not an agricultural people in the true sense of the word, the Phœnicians yet showed their practical gift in the cultivation of the narrow plains around their country homes, and the experience they eventually gained on the more fertile fields of Africa was put by a Carthaginian captain (a curious feat of authorship for such an one) into a hand-book so valuable that the Senate of Rome caused it to be translated into Latin.

For agricultural as well as for civic purposes, reservoirs and cisterns were a necessity in lands like these, and their structures of this character are among the strongest evidences of the Phœnicians' success in work that is rather to be called engineering than architecture. About four miles south of Tyre, and near the edge of the sea, are four great thick-walled, octagonal towers rising about twenty feet, which contain true Artesian wells. The openings were no doubt natural vents, but the skill which utilized them is scarcely the less remarkable on that account. The most abundant is ninety-three feet deep. The walls have been rebuilt or repaired by the Romans, but there is no cause to doubt the Phœnician origin of the device. Every house in a place like Tyre must have been provided with its cistern for gathering rain-water. And at Carthage, we know, the inhabitants drank nothing else. From the necessity for utilizing the rain to the utmost drop, doubtless sprang the invention of street pavements, which the classic writers always credit to the Carthaginians. Even now, deep down under the soil of Carthage are found pavement-slabs, with carefully-laid drains beneath, their mouths under the edge of the foot-walk.

The great reservoirs still in existence at Malka, a suburb of Carthage, have been often attributed to the Romans on account of their vaulted roofs. So M. Perrot stops to examine the question as to whether or no the Phœnicians knew enough of the vault to be entitled to any share in their construction. That they could have been unacquainted with its principle seems impossible; —their connection with Egypt and Assyria was too close for utter ignorance. And at least two examples of the vault still exist in Phœnicia proper;—in two tombs, one of which furnished the fine sarcophagus of Esmounazar, now in the Louvre. But a very restricted use seems to have been made of it in the mother-country, owing, doubtless, to the genesis of Phœnician architecture from the rock itself, its consequent preference for large units of construction, and the ease of obtaining these.

But when they went from home—changed their surroundings and their materials, came, for instance, in contact with the arch-building Etruscans and Latins — it was easy to put their latent knowledge to fuller use. It does not seem, from the evidence one has to-day, as though they used the true keyed arch of the Romans; but it is believed by careful students of their work that they used arches turned in a kind of concrete: "small stones set in a bath of mortar mixed with sand so fine that its grains are hardly to be distinguished, and with lime made from the same material as the small stones. To this mixture lime has given a consistence and homogeneity equal, and not seldom even superior to that of the stone employed." The building stone of Carthage was very poor in quality — a chalky tufa, which often was protected by a coating of tar. So it is but natural that the inhabitants should have made much use not only of concrete, but of *pisé* or beaten earth in building.

From one end of Tunis to the other, the ruins of great isolated reservoirs are found. Two connected basins which stand on the road between Adrumetum and Aquæ Regiæ resemble "a pair of huge tuns in masonry," one varying from forty to sixty-seven feet in diameter, and the other being much smaller. Both are many-sided polygons, the junction of the short, straight sections of wall being reinforced by curious buttresses of two stages, semi-circular on plan. The walls now rise from twenty-three to twenty-seven feet above the soil, and a slit about sixteen inches wide allows the water to flow from

[1] *History of Art in Phœnicia and its Dependencies.* From the French of George Perrot and Charles Chipiez. Translated and edited by Walter Armstrong. In two volumes, illustrated. London, Chapman & Hall, Limited. New York, A. C. Armstrong & Son. 1885. Continued from No. 539, page 199.

No. 541. American Architect and Building News, May 8 1886.

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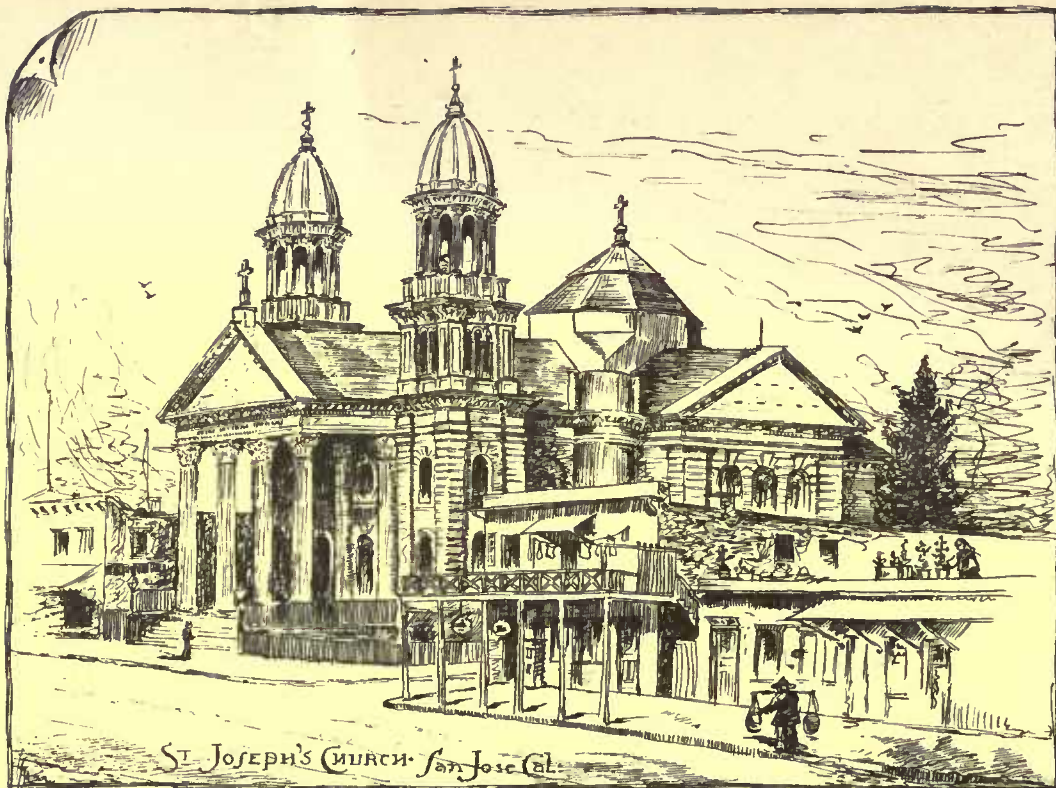
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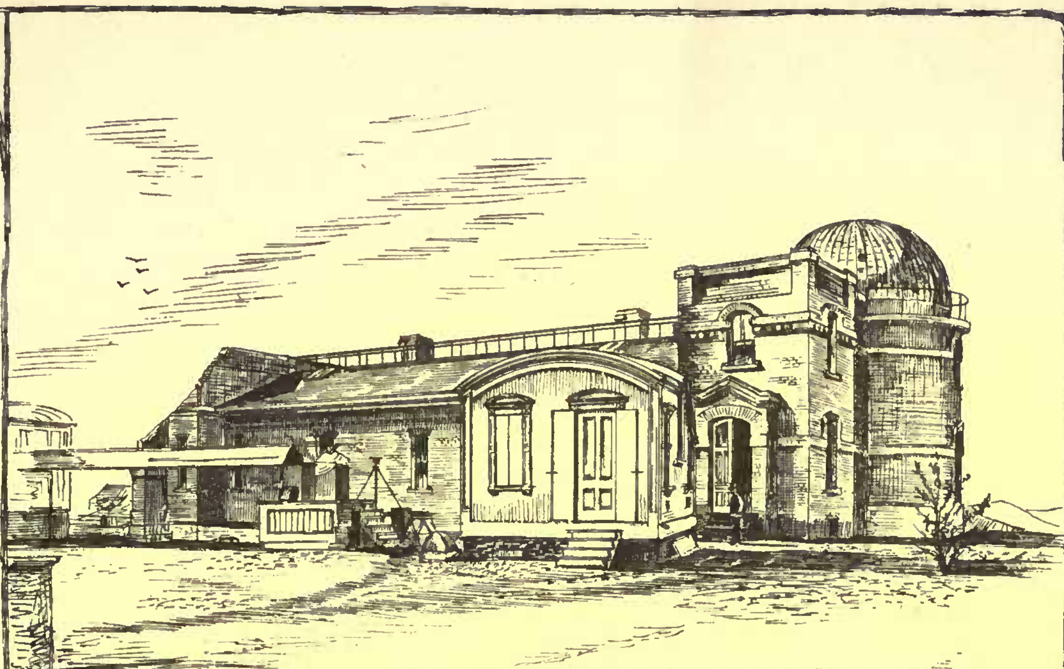
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:The Lick Observatory: Mount Hamilton near San Jose. Cal:



:Sketch: looking: towards: The Entrance on First Floor:

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Sketch. in. Chinatown: San Jose:

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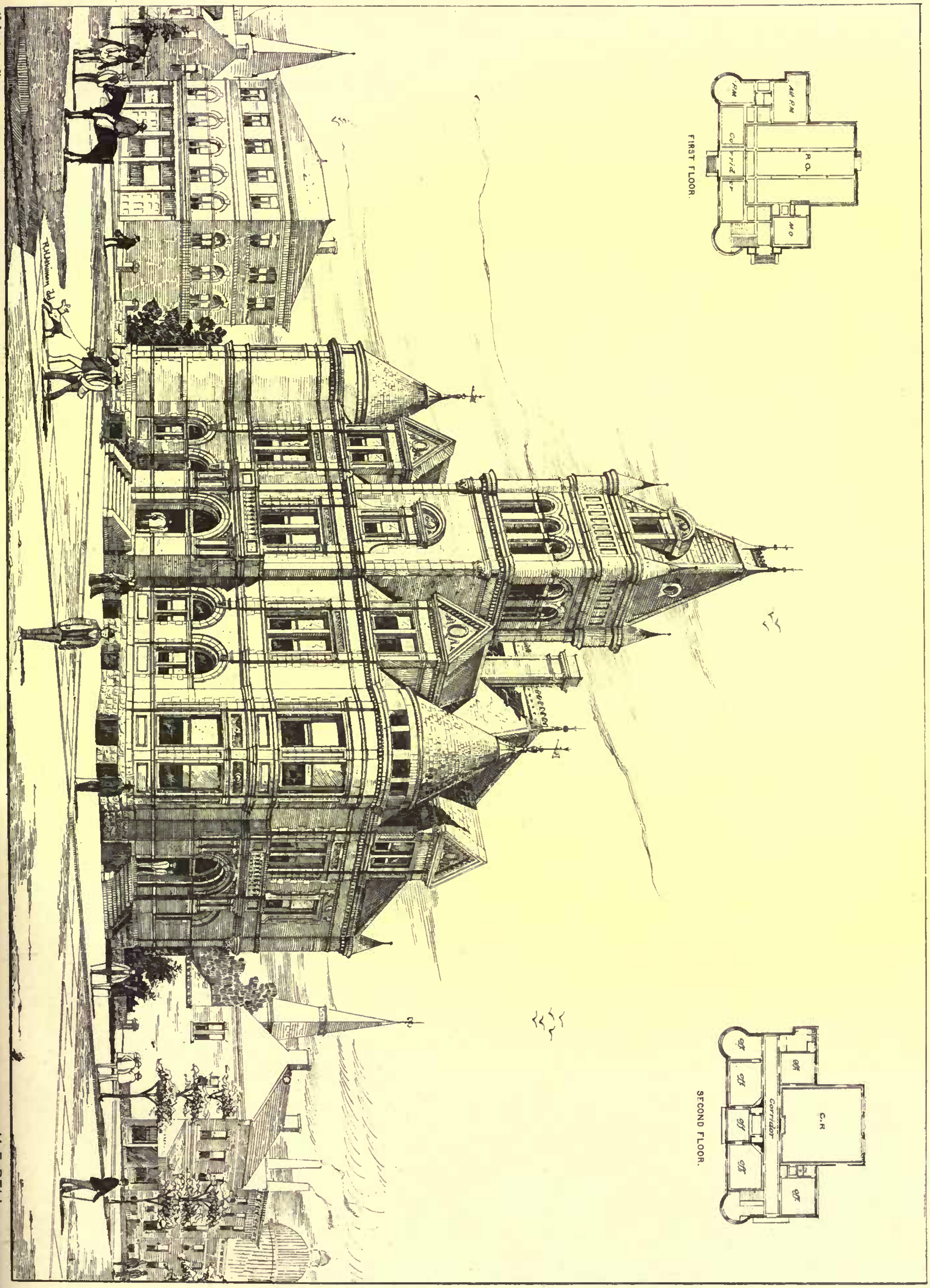


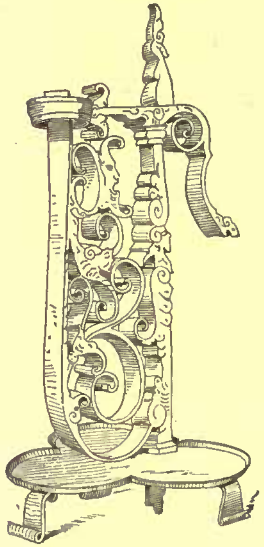


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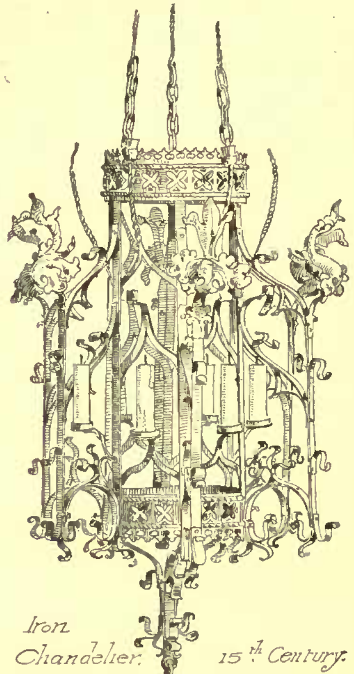
Interior Gallery of Library and Museum
ALGIERS

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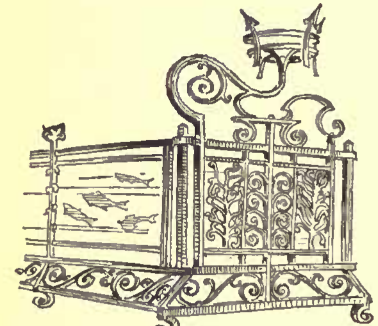




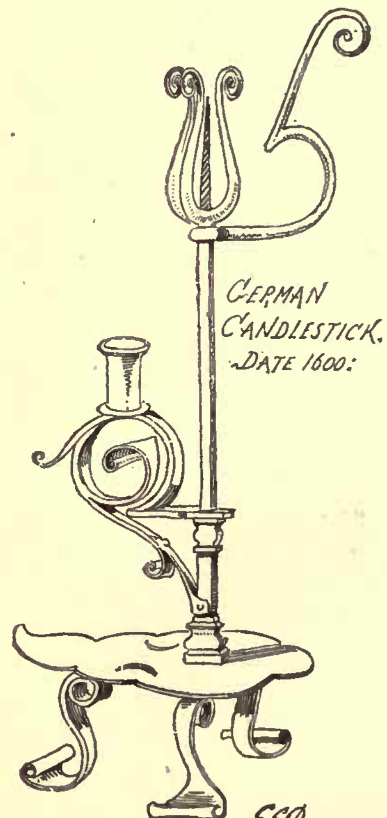
Wro't Iron Candlestick.
17th Cen. – So. Kensington Museum.



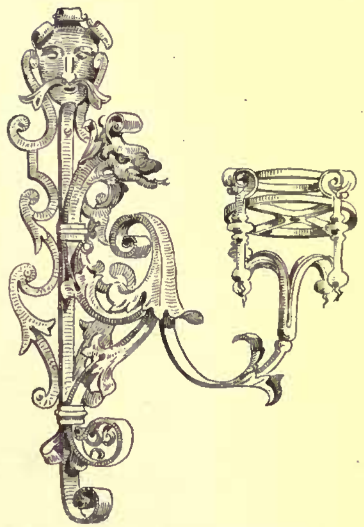
Iron Chandelier. 15th Century.
National Musem. Germany.



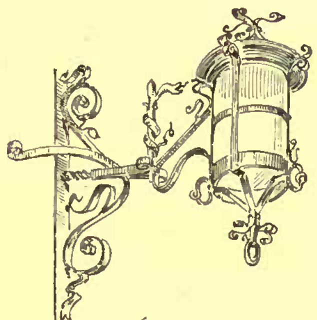
AQUARIUM FRAME.
WRO'T. IRON. MODERN.
FROM MONITEUR DES ARCHITECTES.



GERMAN CANDLESTICK.
DATE 1600:



Wro't Iron. Lamp. Bracket.
by the St Pancras. Iron. Coy London. Engd



LANTERN.
WRO'T IRON MODERN.
'MONITEUR DES ARCHITECTES.



CANDLESTICK.
WRO'T. IRON. (MODERN.)
FROM MONITEUR DES ARCHITECTES.

E.E.Q.

one to the other. These cisterns are undoubtedly of Phœnician origin, being in strong contrast to a third (of rectangular shape and covered with a flat roof), which is evidently a Roman addition to the original arrangement.

Upon none of their works did the Phœnicians bestow more care than upon the creation of those harbors which were so essential to their commerce, but which nature had not always provided for them. Of course, they needed no ports of the size we need to-day, but closed and protected basins were necessary for the discharge of their many trading vessels and the storage of their war-galleys, and in the mother-country the smallest accident of natural formation was cleverly and patiently made to serve their purpose. Though not the oldest, the harbors of Carthage were the most famous of all, and fairly intelligible descriptions of them may be gleaned from the pages of ancient writers. "There were two harbors, an outer one communicating directly with the sea, and an inner basin which could only be reached through the first. The outer basin was the commercial, the inner one the naval harbor. The military pride of the Carthaginians led them to decorate the latter with some richness." It seems to have had an adornment of Ionic engaged columns or pilasters. Ships can no longer penetrate into either of these harbors which are now filled up with mud; but their contours may be followed and even the site of that island on which, we are told, the admiral's palace stood, may be identified. "The quays, with their sheds and store-rooms, still exist under the mud flats and sandy hillocks. When pits are dug to a depth of eight or ten feet the basements of all these structures are encountered, and, at a lower depth still, the clayey sandstone which formed the bottom of the double basin. But such excavations are very difficult and irksome on account of the water and mud which flow into them." It seems as though the harbors were rectilinear on some sides and circular or elliptical on others. A few remains of the Carthaginian admiral's palace were found on the circular island in the centre of the inner harbor which must have been about two acres and a half in extent. "When the harbor was excavated this island was left standing, and wherever the clayey sandstone of the site was wanting the deficiency was made up by regular courses of large tufa blocks. The area thus obtained was inclosed by a quay supported by two concentric walls of equal height. The width of the quay was thirty-two feet including the walls; on the north a causeway thirty-two feet wide connected the island with the land. . . . This causeway was bisected at about half its length by a transverse opening fifteen feet wide through which small boats could pass. There must have been a bridge over the opening like the canal-bridges at Venice. As for the war-galleys there was plenty of room for them on each side of the causeway, which was at the farther end of the dock opposite to the entrance from the commercial harbor."

Large and carefully-dressed blocks seem to have been used in building the palace itself. On some, which have been recognized as parts of a cornice, a coat of stucco painted red and yellow has left distinct traces. The moulding on several of these blocks has a Grecian-Doric character; and the building, like the colonnade around the harbor, probably dates from the Punic period. No shafts or capitals have been discovered. There seem to have been two stories to the palace, as remains have been found not only of its cornice proper, but of what seems to have been a cornice-like string-course.

The site of Utica — a more ancient settlement than Carthage — has been explored only by Daux, who died before the proofs of his interesting theories were given to the world. So his elaborate plans and restorations of the harbor itself and the admiral's palace are given by our authors with all due reserve. According to him the palace was very large and massive, pierced by windows which are not more than slits, flanked by small turrets and roofed in part with spherical domes. And it was built entirely of concrete, so its aspect must have had a somewhat Chaldæan air. Many fragments alike of walls and vaults seem to have afforded rational grounds for his restoration; and M. Perrot argues in a very convincing way against the probability of the Romans being the authors of the structure.

The remains of sculpture in Phœnicia proper are scanty indeed, but sufficient for the defining of the general characteristics of local art. The artist was terribly hampered in two ways — first, by the prevalence of long robes, concealing that form which Greek and Egyptian could study so easily; and then, by the miserable quality of his stone — a coarse tufa, greatly inferior to the fine limestone of upper Egypt and to the soft alabaster of Assyria, not to speak of the beautiful marbles of Greece. But he had terra-cotta also, and might have done better than he did had his artistic instinct been of a higher grade. The human head was at least available, had he cared to study it thoroughly. But he looked at it so carelessly that we cannot even tell from his work what was the real Phœnician type of face. And still less can we discover any relics which seem to be truthful portraits of individuals. Egyptian and Assyrian models inspired his chisel, and not the natural forms he saw about him. In his earliest activity it was doubtless Egypt alone to which he looked, but the oldest clay figures we possess show strong Assyrian affinities. Another element is to be traced in certain works dating from the later centuries of his national life — an element which is akin to the archaic art of Greece. Statuettes exhibiting it with clearness have been found at many points around the Mediterranean basin and have by some been held to show the development of an original impulse in Phœnician work — an element from which the Greeks learned their first artistic lessons. But in the opinion of M. Heuzey, the most careful investigator of the subject, the process was just the reverse of this; — the Phœnician it was who borrowed from the early Greek, already taking his first independent step in art. Yet, neither from Egypt, nor from Assyria, nor from archaic Greece, did Phœnicia borrow in the sense of quite literal imitation. There is always a certain national flavor about her products if only in the way the various influences to which she was subjected show side by side in the same work.

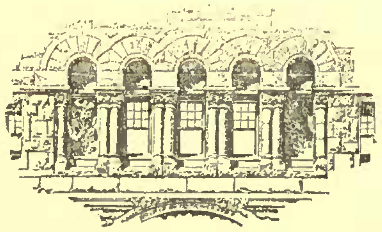
It should be added that she undoubtedly made great use of bronze in her sculpture; but from causes too evident to need explanation, few examples of works in metal have come down to us and these but of the smallest size. Ivory was also frequently employed and undoubtedly wood as well.

Small figures of deities, usually with the attributes of those of Egypt, are among the most frequent relics of Phœnician sculpture; and it has left us also certain fragments of large size of which it is difficult to say with decision whether they were meant for gods or men. A true iconographic intention, based on a true appreciation of individual characteristics, is, as has been said, nowhere apparent. The human-headed sarcophagi to which reference already has been made all belong to the Græco-Phœnician period — except, indeed, the fine sarcophagus of Esmounazar in the Louvre, which seems to have been an imported Egyptian work. "They all reproduce the same type, a type much more Greek than Semitic. Even where the head is covered with the Egyptian head-dress the profile is Hellenic in its lines. More conclusive proof could scarcely be given of the abstract and conventional character of Phœnician iconography."

Many sculptured lions have been found in Phœnicia, evidently based on a knowledge of Assyrian art. But other animals can scarcely be said to have been pictured in Phœnician sculpture. Whether real or fantastic, they occur only among the details of her lavishly-decorated works of industrial or decorative art. Certain remains found in Central Syria have a peculiar and original-seeming character of their own. But they are too few, and too little is known of their creators, for the basing of any definite theories upon their characteristics. Of Carthage and Cyprus I must wait to speak in a final chapter.

M. G. VAN RENSSELAER.

MR. RICHARDSON'S WORK AT NORTH EASTON, MASS.



IT is with very marked feelings of regret that we turn over the plates[1] which exhibit Mr. Richardson's work at North Easton, Mass., — work which he thought well of himself, and yet did not regard as the best which lay within his power; for it was part and parcel of his enthusiastic nature to believe that in the future there were unlimited possibilities for him, each of which was to surpass his last achievement. To some extent his latest work was always his greatest pride. We heard him speak, not many weeks ago, of his library at Malden, Mass., as if he considered it the best thing in that line he had yet accomplished; and at the same time he recounted how he had recently told Phillips Brooks, rector of Trinity Church, that he did not have much respect for his and the members of the Trinity Church Committee's taste, because they had accepted his design for that church. "You ought to have waited," said he, "till I could do such things as I can do now." The speech is comprehensible, for it must have often been to him matter for regret that this opportunity came to him so early in his career. It was one of his greatest virtues that he was progressive; he felt his growth and was confident that he had not yet reached his prime. Better than any outside observer, he could feel wherein his later work surpassed his earlier, and, strengthened by the encouragement and applause he had recently received from his contemporaries beyond the ocean, we may be sure that he would have only added to his fame if he had been allowed to complete the many works he had but just begun. Death has put a stop to the progress he hoped for, but we should be glad that amongst his completed works is left a group of such buildings as these at North Easton, where, unaffected by the uncongenial surroundings of the work of other architects, the student may consider the peculiarities of the style which Mr. Richardson made so markedly his own, and which has encouraged so many imitators that in time, its foreign origin forgotten, it may become known as an American style.

We think the first impression we ever received of Mr. Richardson's work was, that here at last was a man who handled his materials as if they possessed substance—a man who *built* and used real stones and bricks to build with, and yet we had not then seen this Gate-Lodge, this fantasy of a Titan, of which we have heard some architect — a New York architect, too, if our memory serves us—exclaim "I had rather have the credit of having built that gate-lodge than any other building in the country."

It will be remembered that at a discussion of a paper read before the Royal Institute of British Architects (not Bristol Architects, as

[1] *Monographs of American Architecture, No. III.* The Ames Memorial Buildings at North Easton, Mass. Mr. H. H. Richardson, architect. Twenty-three plates (twenty-one gelatine) in portfolio. Price, $6.00. Boston: Ticknor & Co. 1886.

we carelessly allowed it to be printed), Mr. Richardson's work received the warmest praise, and yet the different speakers could not seem to quite agree what name to give the style in which he worked; a difficulty shared by an English architect who printed an interesting little *brochure*, to describe his recent visit to this country, and who says that the carving on the Harvard Law School building reminded him of Venetian work, and who furthermore makes the remark that "after much study I concluded that an arch does not convey the idea of thrust to this architect's mind": a somewhat hypercritical observation, if it referred to the Harvard building, for we do not believe that the most mulish arch in the world could kick over the abutments of the arches there. What name these critics would give to the style of the North Easton buildings we cannot imagine.

We imagine that this "*Monograph*" will prove the most popular of the series, so far as issued, as it treats four separate buildings, of different types and classes, and each of sufficient real interest in itself. The only thing that could add greater interest to the plates would be the inclusion of a greater number of interior views, but for their absence no one can be blamed, as all is shown that the buildings afford of interest, the interior of the Town-Hall being plain and simple in treatment to a degree. Indeed it was sometimes charged that Mr. Richardson needlessly neglected the interiors of his buildings, but in all such cases we imagine that it was found that money was wanting to finish all parts of the building with the same relative degree of richness, and building-committees and clients generally are not so superhuman as not to give the most weight to outside appearances.

Ah, well, the work is done, and the worker gone to his rest with a reputation as well deserved as it is probably envied, and amongst other things left us to hope is that if Mr. Richardson's buildings are to fall victims to the viciousness of their own arches — as his English critic half seems to expect — some of these portfolios may be left to tell the world what our greatest — at least we do not know who has been or is a greater — architect did while struggling against a disease which would have incapacitated most other men years ago.

BRAMANTE.[1]


Bramante, after a Sketch by Raphael.

THE privileged class which could derive profit from the increasing enthusiasm for beautiful things, the spoiled children of fortune, summoned to gather the fruits of this pacific revolution, the artists, in a word, included, at that time in Rome representatives drawn from all parts of the peninsula. Quite early the Florentines and Siennese had planted their flags on the borders of the Tiber, and, thanks to their number and their superiority, they turned the Eternal City into a Tuscan colony. But at the end of the fifteenth and at the beginning of the sixteenth century, the empire which they exercised so vigorously was disputed by other schools, notably by the Lombards. From the north as from the south flocked the most noted masters; all who felt within themselves the force to struggle and the desire to do well burned with the hope of distinguishing themselves upon so brilliant a stage. Foreigners, even, joined them. Rome became an international arena.

The most influential of these masters, the one who deserved to be placed by Julius II at the head of his vast enterprises, was a compatriot, perhaps even a relative of Raphael, Bramante d' Urbino. After having filled Lombardy with masterpieces, Bramante came to seek his fortune at Rome. The construction of the palace of the Chancellerie first drew upon him public attention. Then he was chosen by Alexander VI to assist, if only in the capacity of sub-director, at the building of the fountain of the Transtevere, and the one in the Place St. Peter. Julius II could not delay in distinguishing the artist who had by turn enjoyed the favor of two judges of such delicate perception as Ludovic, the Moor, and Alexander VI. He called at the same time upon the talent of the architect and the science of the military engineer, and hastened to suggest to Bramante the immense task of the reconstruction of St. Peter's. Any other man would have sunk under such a burden, but Bramante, who took to work as easily as Raphael, experienced that liberality of spirit which was needed to direct at the same time all of the other enterprises of Julius II, and they were innumerable. After having finished the construction of the court of the Belvedere, he commenced that of the Loggia, as well as a palace situated in the new street laid out according to his plans, the Via Giulia. From this moment we see him vested with the superintendence of all the pontifical buildings.

[1] Extract from Eugène Müntz's "*Raphael: sa Vie, son Œuvre et son Temps,*" published by Hachette & Cie. Paris. 1886.

Bramante had for a long time lived in misery without having lost any of his gaiety of spirit. For this reason he deserves to be called by his disciple Cesariano "patient son of poverty" — "*Patiente figlio di paupertate.*" If we can believe Cesariano, Julius II had to have recourse to threats to make his favorite architect accept favors such as the lucrative office of "Piombatore," or "Frate del Piombo," that is to say, a member of the corporation to whom is intrusted the sealing of the bulls.

Become rich, Bramante gave free vein to his taste for liberality; his house became the rendezvous of the most eminent artists, whom he delighted to gather around his table. An architect of Perouse, G. B. Caporali, who, like Cesariano, translated Vitrivius, making extraordinary levies on the work of his predecessor, speaks in particular of a supper at which he was present, and at which were present Perugino, Signorelli and Pinturicchio. Perhaps this repast took place in the new palace that Bramante built for his own use in the Borgo, and which in due course became the property of Raphael. Formerly the architect inhabited the Belvedere itself, as witnessed by Vasari.

Such is the mass of problems attacked and solved by Bramante in the vast domain of the art of construction that one might almost be tempted to see in him only an architect of genius, and not one of those fair organizations of the Renaissance, so rich, so vibrating, so (we will not shirk the word) encyclopdic. He is nothing of the sort. Like the greater part of his contemporaries, Bramante did not content himself with excelling in one art only; he was at the same time architect, military engineer, painter and engraver. Fragments of frescos testify to this day the success with which he inspired himself with the principles of Melozzo da Forli, of Giovanni Santi, and of Signorelli. In spite of the neglect of his early education, he even essayed poetry. Cesariano, the translator of Vitrivius, speaks of the facility with which he extemporized. Vasari confirms the statement, and a score or more of sonnets corroborate both. The style of these compositions, often extemporary, is not always correct and clear and without faults, but they testify to a great facility of versification and a good humor beyond all proof. Here the artist makes fun of his own distress, and the rigors of his sweetheart do not appear to affect him any more seriously. In this respect his poetry forms the most striking contrast with the sonnets, so pure and lofty in tone, of Raphael. Bramante also distinguished himself by his humor, which was sometimes aggressive. While he still resided at the court of Ludovic the Moor, a veritable tournament of poesy was joined between him and the humanists of his surroundings. Bon-mots and hits flew from all sides thick as hail upon the architect-poet, but he was of force enough to protect himself, and receive no blow without returning it with usury. We learn that on this occasion he was a headlong partisan of Dante, and he took up with ardor his defence against Petrarch, to whom his opponents accorded the first rank. This admiration created one more bond between him and Raphael, who was not less ardently in love with the divine comedy. At Rome Bramante's sallies achieved the most complete success; he had the knack of making Julius II laugh, who, notwithstanding, did not laugh easily. One day, the Pope, having charged him to engrave upon the façade of the Belvedere the inscription "Julio II Pont. Maximo," the artist imagined the most bizarre rebus. He executed a portrait of Julius Cæsar as representing the word "Julio," a bridge with two arches for the "II. Pont," while an obelisk like that in the Circus Maxims stood for the word "Maximo." It is needless to say that Julius II, after being amused with this pleasantry, ordered these hieroglyphics to be replaced by fair antique letters as long as an arm.

Bramante's reputation for wit survived him. Three years after his death, in 1517, appeared the strange dialogue called "Simia," the Ape, in which the author introduces the spirit of the architect, St. Peter, and divers other personages. Vivacity and the love of drollery flashed in all the phrases accredited to Bramante. He victoriously refutes the attack of the prince of the apostles, who could not pardon him for having ruined his basilica. Then he advances in his turn and threatens if they do not entrust to him the rebuilding of Paradise, that he will go and seek his fortune in the kingdom of Pluto.

Bramante was for Raphael, not only the most benevolent of protectors, he served likewise as his guide, and even master. Not content with initiating him into the secrets of architecture, he traced for him at the moment of the execution of the "School of Athens" the plan of the admirable portico which frames the scene. Besides this, he gave him, by the testimony of Lomazzo, ingenious manikins of the human figure, and also of the horse. Finally, on his death bed, he pointed him out to the Pope, as the only one who was worthy to succeed him in his function of architect-in-chief of St. Peter's. To entrust to his young friend his intellectual heritage, was not this the greatest proof of sympathy that he could give him? Raphael was not ungrateful; in the "Dispute of the Holy Sacrament," and in the "School of Athens," he assigned to Bramante a place of honor amongst the heroes of those two grand scenes. His pupils remained equally faithful to the worship of the illustrious architect. Julio Romano, in his "History of Moses," a sequel to the tapestry preserved of the Cathedral of Milan, placed him amongst the magicians of Egypt, preserving even the very attitude that Raphael had given him in the "School of Athens."

Around Bramante grouped themselves an army of architects and inspectors, verifiers and sculptors all eager to merit his confidence, and secure his favor. Among them were to be counted men of the highest deserts; one of them, a Giuliano Leno, more particularly charged

with administrative functions, joined to a colossal fortune, which was valued at 80,000 golden ducats, a rare intelligence in matters of art, he was more than an assistant, he was a fellow laborer with Bramante. Vasari has consecrated to him a special paragraph in his biography of his illustrious architect-in-chief. "Bramante," he says, "left after him Giuliano Leno, who played an important part in the constructions of his time. He was more skilled in watching over the execution of the designs of others than in inventing them himself, although he had judgment and a large experience." Leno continued to fill the post of curator of the fabric of St. Peter's under Raphael, to whom his collaboration was most precious. Another master, celebrated at that time throughout all Europe, filled the functions of verifier of works (mensurator), though continuing to wield for his own account the chisel and the square; we mean Andrea Sansovino, at the same time sculptor and architect. His favorite pupil, Jacopo Sansovino, who excelled like himself in both arts, did not long delay to enter into relationship with Bramante, and to bow down before the rising sun of the architect-in-chief. He had been summoned to Rome by Giuliano da San Gallo, the enemy of Bramante. But Bramante quickly sought him out, intrusted him with work, and procured him a lodging in the Palace of the Cardinal Rovere, in short, knew how to attach him to his service and his party. The relations of Bramante and Antonio da San Gallo, the nephew of Giuliano, were still more intimate. In a fragment of his auto-biography, which he compiled in 1539, at the age of sixty-one years, Antonio tells us that he entered into the service of Julius II, in 15— (he does n't remember the year), and that from this moment he did not stop working for the Roman Court, first under the orders of Bramante, then as Raphael's colleague in the construction of St. Peter's, and finally as architect-in-chief, side by side with Balthazar Peruzzi. The beginnings of this illustrious artist were sufficiently modest. In 1509, he figures among the contractors charged with the execution of carpentry for the Basilica and Palace of the Vatican. In 1512, Bramante intrusted to him the construction of the corridor conducting to the moat of the Castle of San Angelo. Then he became in succession the carpenter of this castle and fellow-worker of Raphael in the construction of St. Peter's, in 1516, and architect-in-chief in 1520. Very different from his uncle, Antonio seems to have from the beginning sided with Bramante. Vasari insists at length on the service rendered by the young Florentine artist to the creator of St. Peter's. Sometimes he finished the drawings which the trembling hand of the master could only sketch in: sometimes he oversaw the execution of the work. He was bold enough some years later to smartly criticise the character imprinted by Raphael on the works of the basilica. Nevertheless, their personal relations seem always to have been most excellent.

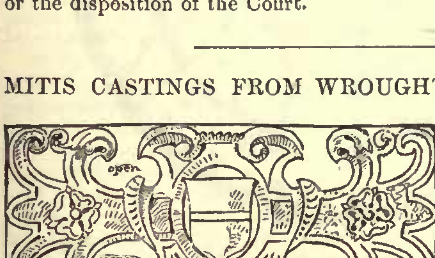
When Raphael succumbed under the weight of his occupations, and demanded a co-laborer should be given him, the Pope designated Antonio, and the Florentine architect consented to work for four years in succession under the orders of the master of Urbino.

Let us enumerate once more amongst the fellow workers, or the pupils of the architect-in-chief of St. Peter's Antonio del Ponte Sieve, whom Albertini cites at the side of Andrea Sansovino; then Raniero, of Pisa, one of the oldest servants of the pontifical court; Vincenzo di Dionisio, of Viterbo, the son of the celebrated clock-maker of Lorenzo the Magnificent; then Alberto, of Plaisance, the architect of the fountain of the Place St. Peter's; Giovanni Maria dell' Abacco, of Florence, and Antonio dell' Abacco, who, in his "*Libro d' Architettura*" recalls with pride that he had the honor of fighting for the first time under Bramante.

In spite of their merit, most of these masters filled the most modest of stations. Their wages didn't exceed five or six ducats a month. One needed to possess transcendent qualities to find entry to the Roman Court.

Such was, at the epoch with which we are treating, the omnipotence of Bramante, that the only artist capable of being measured with him by reason of the universality of his knowledge and the wealth of his genius, Michael Angelo, was relegated to the Sistine without being able to pretend to the least influence on the mind of the Pope or the disposition of the Court.

MITIS CASTINGS FROM WROUGHT-IRON OR STEEL.



Carved Panel : West. Museum, London, Engl.

AT the meeting of the American Institute of Mining Engineers, held in Pittsburgh in February of this year, Mr. Petter Ostberg, of Stockholm, Sweden, read a paper on the production of Mitis castings from wrought-iron or steel, which attracted a great deal of attention. As the subject is one which has special interest for stove and furnace manufacturers, and foundrymen in general, we take pleasure. says the *Metal Worker*, in presenting it to our readers: —

Having brought with me to this meeting a couple of "Mitis" wrought-iron castings, I have found that they attracted a great deal of attention from steel manufacturers, and especially from those experienced in making castings, among whom some have said that they felt inclined to "unhesitatingly declare their manufacture an impossibility" if they had not seen the samples. The successful manufacture of wrought-iron castings depends upon several very important matters, besides the necessary skill of the workman. You must have a suitable metal as raw material; you must have an efficient and suitable furnace for smelting so as not to injure the metal; you must be able to handle the metal in a suitable way from the time it is ready in the furnace until it is poured into the moulds; you must have a suitable moulding material. I claim that in every one of these different branches we have made great improvements essential to the successful manufacture of castings from wrought-iron or low-grade steel.

1. *The Moulding Material.* — The principal properties of moulding material are, that it shall be fire-proof enough for the temperature of the molten metal to be run into the mould, so that it does not fuse and stick to the casting, leaving a poor and coarse surface; it shall not give out any gases nor have a hardening influence upon the casting. We have a patented moulding material (United States Patent No. 317,062) which is perfectly fire-proof at the temperature of molten wrought-iron, and is excellent in every respect. This material is made from pure and good fire-clay alone, hard-burnt, finely-ground, and mixed with sugar or molasses as binding material, which does not, like clay-water, impair the infusibility. The sand made from silica bricks, which is extensively used in this country, does not approach our material in quality, as will be seen by comparing the surface of such castings with any others made even from hard steel.

2. *The Melting of the Metal.* — Wrought-iron requires for melting a temperature of about 4,000°, and I think I am not far wrong in saying that prior to our doing it no one had practically succeeded in melting wrought-iron. When wrought-iron has been melted in crucibles it cannot be said to have been a practical success, considering the time required and the waste of fuel and crucibles, etc. I do not mean to say that our mode of melting is the only way to obtain the requisite heat, but I will say that I do not know of any other way in which you can obtain the result in a sufficiently convenient and practical way to make it a success. As yet we use only crucible furnaces at the small foundry in Worcester, where these castings are made, as well as at the Mitis foundries in Europe. As this furnace (Patent No. 321,840, and another patent to be issued next month) is quite remarkable for its simplicity, efficiency, easy control, regularity in working, convenience and cheapness, I will give a short description. The furnace, in which petroleum is used for fuel, is constructed upon the same principle as a common petroleum lamp.

We all know how important it is for a lamp that the area of the air-inlet holes below the burner should have the right proportion to the area of the funnel, and, supposing that these things are in the right proportion for the maximum efficiency of the particular oil used, we all know how to obtain this maximum efficiency — simply by turning the wick higher, until the lamp is on the point of smoking. But in turning the wick higher or lower, what is it we do? We expose a different area of the wick, and thereby a different area of the oil to the flame. If the wick is not turned sufficiently high, more air than necessary passes through, and the full efficiency is not obtained. If the wick is turned too high the lamp smokes from want of air, and, although it has thus for years been the easiest thing in the world for any one of us to burn liquid-fuel in a lamp without smoke (complete combustion), and with the maximum efficiency, the same long-searched-for result in furnaces was accomplished only a couple of years ago by Mr. L. Nobel, of St. Petersburg, with the assistance of Mr. C. Wittenstrom, of Stockholm. Instead of, as in the lamp, changing the area of oil exposed to the flame, we keep a constant surface of oil exposed, having the area of the chimney in proportion thereto, and regulate the air-inlet up to the point of smoking, thus obtaining complete combustion and maximum efficiency. I may add that this regulation is as easy, as efficient and as convenient as the regulating of the wick in any petroleum lamp. The manner in which we expose a constant surface of oil is by means of horizontal, trough-like fire-bars placed one above another, on which the fuel is maintained at a constant level by means of supply and overflow.

The efficiency of this crucible furnace is really surprising. At a distance of about one foot from the fire-bars we melt crucibles full of wrought-iron at the rate of about 11 meltings in twelve hours, the last meltings taking only 50 minutes, and in exceptional cases only 40 minutes. I will point out that steel melters generally require four to six hours for each melting, although steel melts at a much lower temperature than wrought-iron; and whereas we charge the crucible full (67 pounds) each time, steel-melters charge in the same size of crucibles 60 pounds the first time, 50 pounds the second, and only 45 pounds the third time. And whereas crucibles in other furnaces can only exceptionally be used more than three times, we generally (although melting wrought-iron) use them six and seven times. The regularity of this furnace is so great that we can almost work it by the clock, instead of by watching the melting.

3. *Treatment of the Molten Metal.* — If I should describe, in a few words, what we do in making these wrought-iron castings, it would be this: We take wrought-iron, melt it and pour it into castings of any desirable shape without changing its quality of wrought-iron in any way (fibrousness is not a quality, it is a condition), and obtaining castings that are practically solid. For obtaining this result we

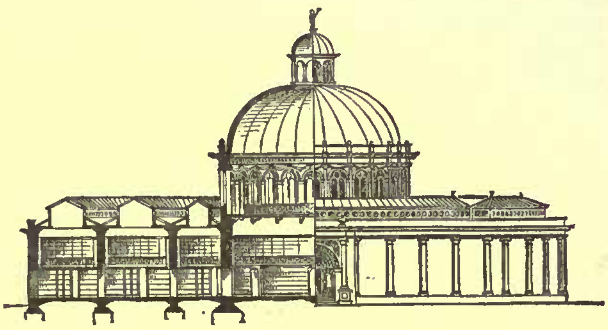
use what we have described until lately as "such physics as we have found most suitable for our purposes." Our physic, however, is not added for the purpose of improving the quality of the metal, as other physics generally, but for altogether another purpose, which I shall explain presently. I will first draw your attention to the fact that if we want to make a casting we must have the metal superheated, that is to say, heated a certain number of degrees above its melting-point. If, for instance, we assume the melting-point of iron to be 4,000°, and we heat it to that temperature exactly, it is impossible to remove it six inches from the furnace before it becomes solidified, and it is thus impossible to make a casting. If we superheat it only a little, we may be able to carry it fluid a few feet to the moulds, but cannot pour any castings. For being able to handle the metal in a practical and convenient way, and pouring it into castings, particularly thin ones, it is thus evidently necessary to have the metal considerably superheated. The way of producing this necessary superheating is to gradually raise the temperature above the melting-point, which operation is generally termed by steel-melters as "dead-melting" or "killing." Now, this operation of gradually raising the temperature above the melting-point is most injurious to the metal. It is during this operation that the metal takes up gases from the surrounding atmosphere. Practically speaking, no gases are absorbed when the metal is solid; it is after the melting that oxygen, nitrogen, hydrogen and carbonic oxide are taken up; and for reducing the injury of these gases many admixtures have been used, such as ferromanganese, silicide of manganese, etc., all of which, to a certain extent, remedy the evil, but at the same time change the nature of the metal, and are rather objectionable in one way or another. Now, as a rule, an ounce of prevention is better than a pound of cure, and it is quite evident that if we could, by some means, superheat the metal some 300° or 400°, without raising the temperature above the melting-point, we should give no opportunity for gases to be taken up. To superheat the metal without raising the temperature above the melting-point, is what we go in for.

Now, it is a well-known fact that alloys always melt at a lower temperature than would be expected from the melting-point of the ingredients. For instance, tin, bismuth and antimony melt at respectively 400°, 500° and 700°, but an alloy of equal parts of these three metals melts at about 170°, that is, a temperature lower than boiling water. Platinum, one of the metals most difficult of fusion, melts at a brown heat if a little lead is added. Wrought-iron melts at 4,000°, but if carbon (which cannot be melted at all) is added to the extent of one per cent, we have tool steel, which melts at about 1,000° less. We have found that the metal aluminium has a very effective influence upon iron in this direction, and also that the addition of aluminium in sufficient quantity for our purpose has no detrimental influence upon the iron. It is of this property of aluminium that we avail ourselves. We heat the wrought-iron just to melting, but not more, and then, as soon as the metal is molten, we add a small quantity of aluminium, from 0.05 to 0.1 per cent, thereby producing a sudden lowering of the melting-point, and obtaining a superheating of, say, 300°, 400° or 500°, sufficient at least for our purpose, to be able to handle the metal in a practical way and pour it into castings. That is the way in which we produce superheating of the metal, not by gradually increasing the temperature above the melting-point, but by suddenly lowering the melting-point of the metal, thus obtaining it superheated in respect to its new melting-point. You will understand that in this way we give the metal no opportunity to take up gases, which is a very important feature in our invention. To an insignificant extent gases are, however, taken up during the melting, but are released by the suddenly-increased fluidity, due to the superheating effect, which changes the consistency of the metal from something like syrup to the fluidity of water. The fluidity, in fact, becomes so great that we can, without difficulty, produce such castings as the samples submitted, which speak best for themselves.

For the benefit of those who may feel inclined to immediately begin experimenting to find out some substitute for our aluminium-physic, I will merely mention that, with caution, lest some one else should find out something equally good, and thereby deteriorate the value of our invention, we have deferred taking out a patent for this addition of aluminium until we had time to go through the most exhaustive and elaborate experiments with every conceivable metal, metalloid and alloy. That is the reason why this aluminium patent (No. 333,373) was not issued until about six weeks ago. And our experience is that nothing else answers the purpose. If added in sufficient quantity, other admixtures always have some injurious effect. Carbon alone can, with advantage, be used in an analogous way, and has, in fact, been so, when hard steel is produced by melting softer steel, and thereafter adding carbon in the shape of pig-iron or spiegeleisen.

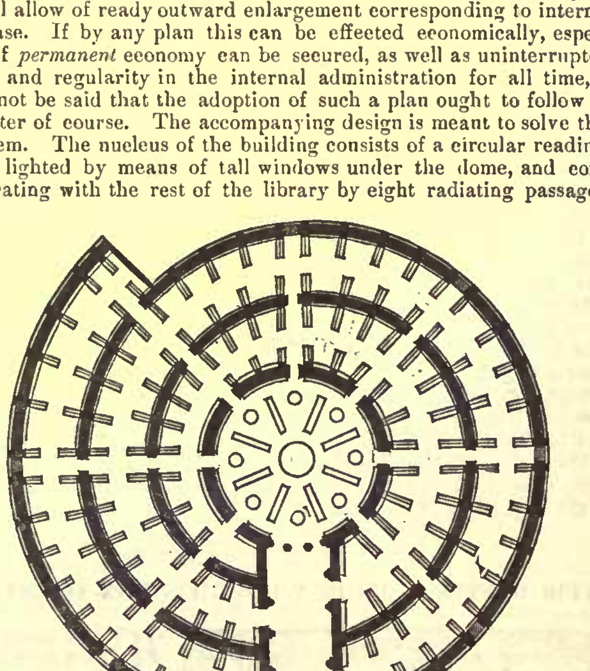
4. *Mechanical Appliances for Handling the Metal.*—If the metal is of ever so good quality, every founder knows what an important part is played by the temperature at which the metal is poured. And if a large quantity of metal has to be poured into a great many moulds it is not possible, with ordinary means, to do it, or at least, not to pour them all at the right temperature. We have several valuable arrangements for accelerating and facilitating the pouring (Patents Nos. 317,063 and 317,064), but I shall refer only to one of them, which I regard as a very important part of the invention. That is, a casting-ladle provided with a cover and with means for producing a flame of high temperature within the ladle. The production of the flame is quite independent of the tipping of the ladle or the opening of the cover. By making the lining of this ladle so thick that the loss of heat through radiation need not be taken into account, heating the ladle to the same temperature as the metal and after the metal is run in maintaining a flame of about the same temperature, we can keep the metal in a proper state for pouring any length of time that may be required. By keeping the flame slightly reducing we protect the surface of the metal from oxidation, without having it covered with slag, and can, therefore, with the greatest convenience and success, pour from the lip, which is, in cases where it is possible, the most desirable way. The flame has its outlet over the pouring-lip, and thereby protects even the jet of metal when pouring.

A NEW DESIGN FOR LIBRARIES.



THE history of the administration of the old libraries of Europe comes pretty much to this, that almost every one has gone through its periods of, first, accommodation without plan in a complex of chambers, until want of premises preclude further expanse; secondly, of internal accumulation and crowding-in of auxiliary furniture for storing the books; thirdly, concurrently with this, of constantly impaired lights, ever increasing confusion, arrears, and finally, a dead-lock, which at last forced the authorities to build a new library, regardless of cost, to go, in its turn, again through the same or similar phases. The more rapidly the productions of literature multiply the more frequently large libraries will pass through this periodicity, and the more treasure will have to be thrown away upon their buildings.

The only remedy for this is to build future libraries on such a plan as will allow of ready outward enlargement corresponding to internal increase. If by any plan this can be effected economically, especially if *permanent* economy can be secured, as well as uninterrupted order and regularity in the internal administration for all time, it need not be said that the adoption of such a plan ought to follow as a matter of course. The accompanying design is meant to solve this problem. The nucleus of the building consists of a circular reading-room, lighted by means of tall windows under the dome, and communicating with the rest of the library by eight radiating passages.



Round this room the library proper winds by the prolongation of one wall; the whole is but one spiral passage carried on to any convenient length, to which light is admitted from vertical skylights under the roof. The height of the wall is supposed to be twenty feet, and the width of the passage about twenty-four feet; this, however, is left an open question. Book-cases are fitted to the wall at right angles, about ten feet in height, exceeding a little in depth the space dividing them. Both sides being used for storage of books, they afford as much accommodation as the adjacent division of the wall. Thus, for book accommodation, a wall to both sides of which these cases are attached (with the cases), represents a surface-measurement amounting to four times that of one side of it. Along the whole

passage light galleries are intended to run, supported for the most part by the book-cases, by which means an easy access is afforded to the upper part of the walls.

A structure of this simple design can be rendered much less liable to damage by fire than almost any other form of building; ample provision could also be made for the absolute security of MSS. and more valuable books. The warming and ventilation of the building would be a matter of no difficulty.

Given the square measure that, on an average, a volume occupies on a shelf, and the height of the wall, as well as the size of the reading-room, the cost of any library on this plan required for a definite number of volumes, can always be calculated beforehand, even to a nicety. When once such a library is built, its expansion can always take place when wanted, at just such a rate as funds for the time being will allow, and without interfering in any way with existing internal arrangements, or the work of the officiating staff, or the convenience of readers. Herein lies the great economy of the plan. I have calculated that a plot of four acres would practically suffice for all time for any library of this description.

The design was drawn under my direction by Mr. Fawcett, of Cambridge; it has been carefully examined by Mr. Waterhouse, who declares it to be "thoroughly practical" when proper provision is made for readers' retiring-rooms, areas for admission of fresh air, etc., "and very inexpensive." Neither architect recognizes in it any obstacle to the erection of a safe and lasting structure.— *Eiríkr Magnússon, in the Athenæum.*

CINCINNATI BUILDING NOTES.



DOORWAY OF THE CHATEAU D'USE.

THE building world in this part of the country has many things to think about just now, and to worry over, what with the streets all torn up, the committees on different projects from the Builders' Exchange and Architects, and one thing or another, it keeps one busy keeping track of the march of events as they write themselves down on the everlasting pages of history.

Well, Cincinnati is to spend, in fact has started to spend, $4,000,000 on her streets; she proposes to tear up no one seems to know how many miles of streets, cart away the rubbish, and lay down granite blocks, asphalt, and similar substances supposed to last a little longer than forever. The streets are dug out about 2.0 below grade, and a substratum of gravel, sand and crushed boulders is laid, and upon this the granite blocks. The whole improvements are under the charge of the Engineers' Department and the Board of Public Works, and as far as inspectors and other officials are concerned, it seems to be well looked after, and promises to do great things for the city.

The Builders' Exchange has done much, and proposes to do more toward the betterment of all things connected with this branch of the city's greatness. They have prepared, after months of laborious effort, a code of building laws for this city; the laws are now in the hands of the State Legislature, and will, no doubt, be passed. If any criticism were to be offered upon these laws, it would be that they were too cumbersome, there being about one hundred and sixty sections, some conflicting with others, so that it will take a Philadelphia lawyer to interpret them. However, anything is better than nothing, and they can be amended from time to time, and thus, by process of time, become nearly perfect. The Exchange has a committee out at the present time, representing each different branch of trade, and it is proposed through them to prepare a glossary of terms common to the craft, and upon which different constructions could not honestly be put, so that when an architect calls for a certain kind of work, it will not be subjected to as many different constructions as there are bidders upon the job.

The architects met recently, and among other things, passed an act requiring builders who are in the habit of bidding on work, and making plans for owners, to cease either one practice or the other; the architects hold that this custom of builders making plans has grown so great that manifest injustice is done to both the owner and the architect thereby.

The County Commissioners propose to build some additions to the County Lunatic Asylum, and in pursuance of this commendable idea, they wrote to some, and advertised to all the architects to inform them (the architects) that on a certain day, and at high noon on said certain day, they (the Commissioners) would open bids for making plans and specifications for the proposed improvements, the cost of which was placed at $125,000. The architects in a paper signed by all, replied that "bidding" was not the proper way to employ efficient architectural services, that if such services are wanted the architect should be employed at the usual rate of five per cent upon the cost, with full architectural powers, and to execute the building in accordance with the wishes of the Board, and the best interests of the building. What the result will be is hard to tell, but no doubt the Commissioners will get some one to take the job at their price.

SOCIETIES

THE LATE H. H. RICHARDSON.

AT a special meeting of the Boston Society of Architects, the following resolution was adopted:—

Resolved, That the Society feels a profound sense of the loss which it has sustained, in common with all who have at heart the interests of good architecture, in the death of Henry Hobson Richardson. In his brilliant career, which is now brought to a close, we recognize the rare union of wellnigh all the great qualities on which true success in the practice of architecture depends. He had the instinct for form, proportion and color, the genius for orderly arrangement and picturesque grouping of parts; and, in addition to all this power, he had an extraordinary force and energy of character, which enabled him to use his gifts to their utmost advantage, to despise the pain and weakness of an insidious and fatal disease, and to work with unflagging zeal and efficiency up to the last day of his life. His gifts and his courage, brightened by a remarkable intellectual vivacity, made him the most interesting and commanding personality which the profession in America has ever known. He died in the full maturity and vigor of his power, but not before his fame was assured by the monuments which his genius had raised on every hand.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

PAPER TILES.

BOSTON, April 29, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Can you give me any information in regard to paper roofing-tiles? Where are they made, and by whom? A reply through the columns of your journal will oblige, Yours truly,

WM. G. PRESTON.

[WE cannot, but we hope some reader can give the information which others have sought before.— EDS. AMERICAN ARCHITECT.]

THE BOSTON BUILDING LAW.

INDIANAPOLIS, IND., April 27, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Was the Building Law, introduced in the Massachusetts Legislature about a year ago, passed? Can a copy be had of the bill as originally drafted, and if so, to whom should I apply?

Yours, etc., INSPECTOR.

[WE do not know whether you can obtain a draft of the *original* bill, but you can obtain a copy of the revised law by addressing John S. Damrell, Inspector of Buildings, Boston.— EDS. AMERICAN ARCHITECT.]

THE BEST DRAIN-PIPE.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

NEWPORT, R. I., April 26, 1886.

Dear Sirs,—I notice in your last issue that you tell Mr. Williams, of Portland, Oregon, that "Akron" pipe is better than cement. I suppose you use Akron as a generic term, but it is hardly fair to other good pipe-makers to do so. There are, to my knowledge, four or five other large concerns in the country — one of them at Portland, Me., which make pipe every whit as good as the Akron; I should say "vitrified stone-ware pipe." Excuse the suggestion.

Truly yours, GEO. E. WARING, JR.

[WE certainly had no intention of advertising the Akron makers at the expense of others. "Salt-glazed" would have been enough to say.—EDS. AMERICAN ARCHITECT.]

BACK-LINING.

WASHINGTON, D. C., April 29, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Will you be kind enough to inform a student what is meant by "back lining," as applied to drawings. I have asked several who should know, but they did not seem to be informed.

"A STUDENT."

[BACK-LINING is a means of giving emphasis to a drawing by enforcing what may be termed its contour lines — not only of the main-drawing, but of its important features as well — that is, the lower and right-hand lines of projections of all kinds, if the light is supposed to come from the left.— EDS. AMERICAN ARCHITECT.]

FRESH-AIR BOXES AND SOIL-PIPES.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— In a discussion in regard to the advisability of running a drain under a furnace and cold-air box, an architect of considerable practice told me that he would just as soon as not live in a house in which the drain carrying the soil-pipe wastes ran directly

through the air-box, and leaked into the latter, explaining that the cold air passing through the box would destroy any possible ill effects of the leak. Will you kindly give me your opinion on the subject, and greatly oblige SUBSCRIBER.

[IT seems to us that the sooner this "architect of considerable practice" arranges his own fresh-air flue and soil-pipe in the manner he advocates, the better it will be for those who might, under other circumstances, become his clients.— EDS. AMERICAN ARCHITECT.]

"BULBOUS' DOMES."

TROY, May 3, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,— A few months ago I sent you a letter asking a question to be answered through your valuable journal, and thinking it may have been miscarried, I will try once more.

In studying the architecture of the Russian chambers, you find the "bulbous' domes" finished with a cross, and extending from its arms chains (it looks like) down upon the dome. To help you to understand my meaning, I have drawn the parts referred to in *red* ink. Why are they put there? Yours respectfully,

FRED. R. COMSTOCK.

[AFTER seeking in vain for an answer to the question our correspondent puts in the books which seemed to us most likely to throw light on the subject, we sought information of the Russian Consul, but found that he had no definite knowledge to impart.— EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

EXCAVATING MEXICO'S ANCIENT HOLY CITY. — The work of laying bare the great buried Mecca or holy city of the Toltecs, at San Juan Teotihuacan, is soon to commence in dead earnest, under the direction of the enthusiastic archæologist, Leopold Batres, the government inspector and collector of antiquities. Careful sketches of the present condition of the historical spot, drawn by Mr. Becerril, of the School of Mines, are on exhibition at Pellandini's art-store. President Diaz finally refused to allow the troops to engage in the work of excavation, presumably because the soldiers may be needed for the work of the drainage of the valley, but arrangements have been made to hire 300 peons (laborers) to do the work. Mr. Batres says that in about twenty days the spades will be flying lively, and that, within three months' time, he expects to lay bare the great Pyramid of the Moon. He still insists that a great city lies under those sandy stretches above which the pyramids lift their gray heads. A switch is being laid from the track of the Vera Cruz Railway for the transportation of material and men to the scene of the interesting operations. — *Mexico Two Republics.*

HEAT FROM INCANDESCENT LAMPS. — Herr Wilhelm Penkert, in the *Zeitschrift für Elektrotechnik*, gives the following results of his experiments to find the quantity of heat emitted by different lamps, incandescent and other, in an hour: —

	Units of Heat.
Incandescent Lamps:—	
Siemens and Halske	427
Edison	355
Swan	430
Bernstein	153
Gas: —	
Siemens regenerative burner	1,500
Argand	4,860
Two hole burner	12,150
Petroleum: —	
Round burner	3,360
Small flat burner	7,200
Solar Oil: —	
Schuster and Bauer's lamp	3 360
Small flat burner	7,200
Rape oil: —	
Carcel lamp	4,200
Reading lamp	6,800
Paraffine candles	9,200
Spermaceti	7,960
Wax	7,960
Stearine	8,940
Tallow	9,700

With regard to the value of the Bernstein lamp, M. Penkert thinks that it is possibly too low, owing to the fact that in the measurements losses of heat were not absolutely guarded against. The construction of the lamp was such that it could not be entirely immersed in the water employed to determine the heat given out.—*Scientific American.*

THE PHILOSOPHY OF VACCINATION. — Professor Tyndall explains the philosophy of vaccination as follows:—

"When a tree or a bundle of wheat or barley-straw is burned, a certain amount of mineral matter remains in the ashes — extremely small in comparison with the bulk of the tree or of the straw, but absolutely essential to its growth. In a soil lacking, or exhausted of, the necessary constituents, the tree cannot live, the crop cannot grow. Now, contagia are living things, which demand certain elements of life, just as inexorably as trees, or wheat or barley; and it is not difficult to see that a crop of a given parasite may so far use up a constituent existing in small quantities in the body, but essential in the growth of the parasite, as to render the body unfit for the production of a second crop. The soil is exhausted, and until the lost constituent is restored, the body is protected from any further attack from the same disorder. Such an explanation of non-recurrent diseases naturally presents itself to a thorough believer in the germ theory, and such was the solution I had in reply to a question I ventured to offer nearly fifteen years ago to an eminent physician. To exhaust a soil, however, a parasite less vigorous and destructive than the really virulent one may suffice; and if, after having, by means of a feebler organism, exhausted the soil without fatal result, the most highly virulent parasite be introduced into the system, it will prove powerless. This, in the language of the germ theory, is the whole secret of vaccination.

CLEANSING WATER MAINS. — While in many cases the iron pipes remain unaffected by the water flowing through them, in others incrustations are deposited which sometimes endanger the working of the plant after only a few years' use. Such deposits are formed in nearly all water-mains for town supply, in course of time, and consist mainly of iron oxide and carbonate of lime, and would ultimately destroy the pipes or render them useless unless removed. Three methods have been employed for this purpose, says a contemporary, corresponding with those used for removing boiler scale, namely, taking up the pipes and loosening the scale by heating, dissolving the deposit by acids, and removing the deposit mechanically before it hardens, by means of scrapers and brushes. In the first method the pipes, after taking them up, are placed over holes in the top plate of a stove, and serve as a sort of chimney. The deposit and the iron expand at different rates, and the former is thereby detached. In this way a main 32 inches diameter and about 770 yards long, at Laibach, was cleaned, and the cost per yard amounted to about 2*s*. 1*d*, being about one-quarter of what the renewal of the mains would have cost. The second method cannot, of course, be used for iron pipes, but is applicable to lead pipes. Mr. Arcel cleaned, in this way, a length of fifty yards of 9-inch piping with hydrochloric acid, 76 per cent at a cost of about 2*s*. per yard. The third method is in use at Carlsruhe, Nuremberg, and other German towns. A rope or chain is introduced into the mains, by means of which a brush suiting the bore of the pipes is worked to and fro till the deposit has been detached, a continuous flow of water being directed upon the brush to remove the mud. For cleansing strongly-curved lengths, Mr. Merz has introduced a flexible pipe brush. In this manner the entire mains of Carlsruhe have been cleaned, the cleansing of about 22,000 yards of pipes of 3 3-4 to 14 inches diameter having been effected during 78 days at a cost of about £160. — *Mechanical News.*

TRADE SURVEYS

WITH all that is to be said against organized labor, there is less to be feared from it organized than disorganized. The organization of capital is sure to follow the present uprising. Conservative influences will also arise within the ranks of labor itself. Trades unionism, pure and simple, is aroused at the threatening attitude and assumptions of associated labor, and the latent jealousy which has always existed between rival labor organizations will soon be a factor for good. There are probabilities that the results of the eight-hour movement will not be permanent. The next general depression will create a reaction more or less general. It is not clear just what organized capital can do under the facts and conditions presented. The first impulse has been obeyed, viz., that of getting together in certain industries. The incentives to unity are not likely to be permanent. Temporary ends only can be served at this time. A reaction is, in the nature of things, inevitable in this whole labor movement; and until then employers cannot see clearly what course to pursue. That the tendency to higher rates of compensation cannot be arrested were it desirable so to do, is apparent to all students of and thinkers on economic subjects. The general improvement in the condition of the masses is desirable. The solidarity of labor will be eventually effected. Temporary inconvenience and injustice will be suffered in exceptional cases. The consumptive capacity of the masses must and will increase, and the so-called unreasonable demands of labor will be one after the other met. These apparently dogmatic assertions are based on manufacturers' experience on both sides of the water during the past thirty years. The week has been an eventful one in industrial channels. A few thousand men are on strike at this writing. Employers in New York, Philadelphia and Chicago have in two or three crafts combined to resist the ten-hour pay demand of eight-hour labor. The building-trades are nearly all quietly at work, in most cases at moderate reductions. New York architects and builders do not make many serious complaints. Philadelphia architects will have a great deal of work to announce in a few days. Pittsburgh builders speak of excellent building prospects. Farther-western architects report that the check given to building is mostly in the way of a temporary withholding. The projected work, they say, is absolutely needed. The most unfavorable reports come from real-estate interests, but even here some advantages accrue in the withdrawal in many cases of fancy prices for building sites in the way of additional encouragement to projectors. Material continues cheap. The condition of the lumber-markets along the Atlantic Coast and throughout the chief distributing centres in the interior is abundance and low prices. Labor agitations has taken the wind out of the sails of high prices which began to be felt early in the season. Actual selling-prices of spruce, white and yellow pine and the hardwoods generally are no higher, and there is no disposition to crowd them up. Supplies continue large in primary and secondary markets and what has been lost in higher prices of labor has been possibly saved in cheap material. The textile industry is entering on its dull season. The iron trade is strong and steady, all branches being well oversold. There is evidence of increasing activity in railway construction west of the Mississippi, no less than fifty million dollars have been negotiated for during the past thirty days by the managers of western lines, for the prosecution of building in the region west of that river. The rail-mills have one third of their capacity unsold, and are coyly declining business at present in view of a rush of orders in July and August when the requirements of some of these new enterprises will probably be presented. Pig-iron requirements have increased 5,000 tons per day within one year: lumber requirements ten per cent. Bridge-iron demand will crowd the work for the rest of the year. Money continues abundant. Collections are easy, but in many rural localities cash is scarce. Considerable idle money is floating into western channels. The coal trade is quite active and coastwise freights are strong. The interior machine shops and factories suffer very little. Work at locomotive establishments is increasing slowly, and during the past week New York and Pennsylvania car-builders have booked additional work. The actual facts are favorable. The fears expressed imply only fear. The builders will crowd ahead knowing what to expect. Employers can be easily aroused. Any further agitation efforts will create a public sentiment against labor domination, which the leaders see and feel and therefore they are crying out against further striking, and advising against all manner of extreme action.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. No. 542.

Copyright, 1886, TICKNOR & COMPANY, Boston, Mass.

MAY 15, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

MR. WILLIAM EARL HIDDEN writes to the *Scientific American* an interesting letter about the crystal spheres which are now brought from Japan, and sold at such enormous prices. Architects are usually supposed to be connoisseurs in bric-à-brac, and most of them have probably had occasion to study the beauties of these transparent globes, which, when judiciously mounted, are certainly among the most attractive objects brought from Japan. Of late years they have become very fashionable, and the prices have risen to an extravagant height, one in the Morgan collection, not of remarkable size, being only four-and-one-half inches in diameter, having been sold at auction for seventeen hundred and twenty-five dollars, while one of nearly seven inches in diameter, which was, we think, exhibited at Philadelphia in 1876, is held by its owner at the price of five thousand dollars. When these balls were first imported to this country, surprising stories were told about them, most of which were probably fabulous. It was said that their sphericity was more perfect than that of any product of the arts of civilized nations, and that the precision of curvature was obtained by delicate hand-polishing, continued for many years by workmen of trained perceptions; and it was often asserted further that the quartz crystals of which they were made were much harder than the crystals of quartz found in this country.

MR. HIDDEN, who had occasion to interest himself in the matter, noticed at once the absurdity of the claim that Oriental quartz crystals were harder than the same mineral in other places, and, believing that some of the other properties of the Japanese spheres existed only in the imagination, he determined to test the possibility of making similar ones with the appliances of modern nations. For a long time he found no clear crystals of quartz large enough for his purpose, but, obtaining one at last of sufficient size to make a sphere two inches in diameter, he gave it to a lapidary, with instructions to turn and polish it as quickly as possible. Instead of devoting years to the work, the lapidary brought to him within a week a clear and perfect ball, as round and well-polished as any Japanese work. Some time afterwards, having procured a still larger piece of crystal, he submitted this also to the care of the lapidary, who wrought it in ten days into a perfect sphere, three and one-sixteenth inches in diameter, and weighing a pound and a half. It would be strange if a country which can polish telescope lenses for the whole world could not turn a sphere of crystal, and there is, in Mr. Hidden's opinion, no reason why crystal balls, if the material could be found, should not be made here, and probably at a price which would approach much nearer to the value of such things in San Francisco twenty years ago, before fashion took them up, than to the present cost. It is rather remarkable that there are several references in Latin classics to the crystal balls, which, according to the accounts, were held by the Roman ladies in their hands to cool them in hot weather, and it is not unlikely that they were brought to Rome from China, if not from Japan. Even in these extravagant days, few ladies would venture to cool their hands with such fragile objects at seventeen hundred dollars apiece; but if the price should fall to a small fraction of the present rates, it is quite possible that some such way of using these delicate and beautiful playthings might be revived.

THE *Sanitary Plumber* says that the French Academy of Sciences has in its custody a fund of one hundred thousand francs, or twenty thousand dollars, bequeathed in 1849 by M. Bréant as a prize for the discoverer of "an efficacious remedy for Asiatic cholera," or for the person who shall determine the causes of the malady with such certainty as to render it possible to extirpate it by removal of the conditions on which its existence depends. If the fund has been allowed to accumulate at interest, as would, we suppose, be the case, it must amount now to a comfortable fortune, and a well-trained young physician, with a taste for investigation and a scanty practice, might do worse than take up the subject in earnest. To earn the prize it is necessary that the applicant should show that he has discovered either the way to prevent the development of the disease in a community, or a remedy which cures a very large proportion of the persons attacked by it, or a prophylactic treatment as effective against it as vaccination is against small-pox. So much has been done within the past ten years toward the elucidation of the history of this dreaded disease, that it does not seem extravagant to hope that it may, before the present generation has passed away, be brought so far under the control of medical science as to take its place, at least, with small-pox and scurvy, as one of the maladies which ordinary care can guard against, if not with the plague and jail-fevers, which soap and water and fresh air have banished from civilized countries.

SOME trifling indication as to a line of investigation of the subject which has hardly yet been thoroughly followed out, may, perhaps, be found in some of Pasteur's experiments which have been recently recalled, with some interesting comments, by Dr. Mott, of New York, in an article in the New York *Herald*, quoted by the *Sanitary Plumber*. According to Dr. Mott, the well-known French authoress, Madame Durand-Gréville, was bitten by a mad dog some twenty years ago, but escaped serious consequences by a prompt cauterization of the wound. Some time afterwards Madame Gréville was in St. Petersburg, and heard there about the treatment adopted by the Russian peasants in cases of hydrophobia, which consisted in shutting up the patient in a vapor-bath, kept at a very high temperature. If the patient was not suffocated by the heat, which occasionally happened, he came out of the bath cured of the disease. Returning to Paris, Madame Gréville told this to her husband, who pointed out that M. Pasteur had recently read a paper before the French Academy, showing that he had been able to inoculate fowls with anthrax, the most malignant, perhaps, of all communicable diseases, and cure them with certainty by simply keeping them at a high temperature for a few hours, while others, similarly inoculated, but not subjected to a change in temperature, invariably died. Madame Gréville immediately wrote to M. Pasteur, mentioning what she had learned in Russia, and received a note in reply, in which the great pioneer in the study of ferments expressed his conviction of the importance of the suggestion, saying that he should remember it if he ever had occasion to investigate hydrophobia, and remarking that he was convinced that anthrax in man would be easily overcome if the patient could be kept, either partially or wholly, for several hours at a temperature of forty-one degrees centigrade, or about one hundred and six degrees Fahrenheit. This is only three degrees above the normal temperature of the blood, and is far below the temperature of the hot-room in a Turkish or Russian bath. Whether cholera, like anthrax, could be controlled by keeping the patient in either a warm or a cool atmosphere, is at present quite uncertain; but as there seems to be good reason for believing that two very serious communicable diseases may be held in check by raising the patient's temperature, it would seem to be, at least, worth while to try the experiment with others, and it is, perhaps, of some interest to note that such warming of the patient as can

be done with hot cloths and similar applications to the skin is usually recommended in directions for the treatment of cholera.

LA Semaine des Constructeurs speaks of an important archæological discovery, which has, according to the Greek journals, been made in Atheus. Some eight years ago, investigations showed that portions of a very ancient structure existed beneath the walls of the Erechtheum, and although the attempt to discover the character of this building was abandoned, excavations have been made from time to time in the vicinity of the Erechtheum, which have resulted in the discovery of a considerable amount of débris evidently belonging to the ancient structure. In February last, a small party of workmen, excavating in this locality, brought to light a number of statues, of archaic appearance, together with some terminal figures, inscribed in letters of a very antique style. The forms of the letters, with the character of the sculpture, enabled the Greek archæologists to refer the statues and other objects with certainty to the sixth century, B. C., and it is presumed that they must have belonged to the building now covered by the ruins of the Erechtheum. The most curious thing, however, about the statues is that all of them have the hair and drapery painted, and many are decorated with metal ornaments, while the eyes of one are of crystal. Nearly all the statues are more or less mutilated, but the forms, independent of the richness of their coloring and ornaments, show the beauty of the best archaic Greek sculpture. It is now pretty well understood that the coloration of Greek sculpture as well of as Greek architecture was a tradition handed down from the earliest times, and it is interesting to find so remarkable a series of examples in tolerble preservation. So far as the artistic effect is concerned, we have no reason to suppose that the coloring added any more to the beauty of the statues than it did to that of the buildings, whose appearance we can now reproduce with tolerable certainty, and those critics who expatiate upon the imaginary glories of Grecian painting are probably quite as far from the truth as those of the olden school, which repudiated the notion that the ancient Greeks ever sullied with pigments the classic purity of their temples, and attributed the remains of paint upon them to the sacrilegious meddling of barbarian conquerors, but it would be of some importance to know whether the richness and harmony of their coloring increased or diminished with the advance of the Greeks in the other arts.

WHETHER the Greeks, far from being consummate colorists, really possessed much of what we call the color-sense, is very doubtful. The Egyptians, who were in most things the teachers of the Greeks, and who have left myriads of colored objects behind them, possessed a knowledge of certain simple harmonies, and made glass of a beautiful shade, but it has never been shown that they had any conception of such effects of color as those, for instance, with which the Chinese have for ages kept themselves surrounded. That the Greeks knew and cared still less about the matter than the Egyptians is indicated by the examples which they have left; their vases, for instance, instead of the inexhaustible loveliness of the old Chinese ware, showing nothing but elegant drawings in black, red, and white, as if those who made them avoided purposely any attempt to give by color a charm which might have detracted from that of the forms, while the coloring of their buildings, however the pigments may have changed in twenty-three hundred years, can hardly have been anything else than crude and disagreeable. Their literature, moreover, shows a very small degree of color-perception, Homer, the closest observer of nature among the ancient writers, usually speaking of the sea indifferently as the "purple" or the "wine-colored," while he commonly calls Athena the "green-eyed." Such a student of color as this would find the Chinese name of "sky after rain," for a certain enamel pigment, quite unintelligible, and there is no ground for supposing that his compatriots knew or cared much more about the matter than himself. The Pompeian frescos hardly show any advance over the exterior painting of the Sicilian temples in respect of harmony of color, notwithstanding their charm as decorative compositions, and the Romans, with all their precious marbles, secured nothing better than an imposing costliness of effect. It seems, therefore, quite impossible that the colored archaic statues of the Greeks could ever have been anything more than tawdry images, relieved by their beauty of form from any offensive character, but deriving from their color no increase of attractiveness or expression. Whatever is to be done in this way for the enhancement of the sentiment to be conveyed by sculpture seems to have been reserved for the moderns. Luca della Robbia did something to point out the path to be followed, but the world has yet to see the beauties of which sculpture is capable endowed with that life which tender and perfect color can alone give.

A BUILDER'S case, of a very familiar sort, was tried in England a few weeks ago, with the usual result. The plaintiff, a contractor, was asked by the defendant one day how much it would cost to paint and grain his shop inside and out. The contractor looked about, and replied that it would be about a hundred dollars, but that he had better make a regular estimate. The defendant, however, told him to go about the work at once, which he did, and after completing it, together with some extras, he sent in his bill, amounting to one hundred and thirty-five dollars, which the defendant refused to pay, and the contractor brought suit to compel him to do so. On being brought into court, the defendant claimed that he had contracted with the plaintiff to do all the work mentioned in the bill for a hundred dollars, and asserted also that the charges in the bill were excessive, bringing forward a building-surveyor, who testified that the amount was too large. On cross-examination this witness admitted that he had not measured up the work, and two other witnesses, who had done so, testified that in their opinion the value of the work was one hundred and sixty-five dollars, and the judge decided that it did not appear from the evidence that there had really been a contract between the parties, or that the charges in the bill were excessive, and he therefore ordered judgment for the plaintiff with costs.

THE *Scientific American*, in its descriptions of recent patents, gives one of a novel method of carpeting stairs, which is well worth the notice of architects who like to see occasional variations in the common methods of doing such things. In the new mode, the tread of each step is covered with a separate piece of carpeting, which is brought over the edge of the nosing, and held in place by the cove moulding, leaving the riser exposed, while a strip of brass, bent around the nosing, covers the ends of the pieces. With ordinary carpeting, perhaps the expense of hemming all the small pieces would prevent the new device from being very useful, and we doubt if the cove moulding would answer well for holding the carpet in place, but it is quite conceivable that small rugs might be made in such a way as to be held separately to the steps by brass bands, sprung or screwed on, with excellent effect. The richest effect of stair-carpeting that we know is that obtained by putting on long Daghestan or Persian rugs, with fringes, securing them by the ordinary brass rods. Most stairs require two or three rugs, and as these are usually of different colors and patterns, the variations give a special interest and attractiveness to the staircase, while the changing lights bring out the coloring of the rugs.

IRON makes a sensible observation in regard to the dangers involved in the practice of calculating the probable wind pressure on bridges by assuming that it acts only on the actual area of the surfaces exposed. It is well known that when water runs through openings in a perforated plate, the discharge is reduced, by the clinging of the liquid to the sides of the openings, to about sixty-two per cent of what it would be through a single opening equal in area to the sum of the small separate ones; and, arguing from this, *Iron* concludes that the air, in blowing for instance through a lattice bridge, may cling to the members of the lattice in such a way as to give a considerably greater pressure on the bridge than would be due to its action on the iron bars and plates alone. There can be no doubt, we think, that this is actually the case. In fact, air is a fluid of a much more glutinous character, in proportion to its specific gravity, than water, and, although there are no statistics on the subject, it is quite probable that its adhesion to the sides of tubes or openings through which it flows is greater than that of any liquid, and that forty per cent addition to the area of the solids in calculating the wind pressure on a bridge is too small, rather than too large. The whole subject is of the greatest interest and importance, and, as the apparatus for making a few simple tests would not be expensive, we commend the matter to the attention of such young architects or engineers as may have a little leisure during the coming summer.

MURAL PAINTING.[1] — XI.

WATER-GLASS.



From the Frescos by Julius Schnorr, in the Royal Palace, Munich.

IT is with reluctance that I broach the water-glass method; for I have neither worked in it, nor seen the important water-glass pictures painted by Kaulbach and his school — not to mention others. The whole subject is amply treated in W. Cave Thomas's "*Mural Decoration.*" A translation is there given of the amphlet by Dr. J. N. Von Fuchs,[2] the inventor of the process, as well as an elaborate statement by Maclise, of his personal experience with water-glass preparatory to painting his mural pictures in the Houses of Parliament. From these sources I shall draw just enough to give a general idea of the process, adding a few extracts from a paper that appeared in the *American Architect* (Vol XV., No. 429), descriptive of the later and improved Keim water-glass method; for no survey of the technics of mural painting would be complete without some reference to stereochromy, as its inventor calls this kind of painting (from στερεὸς, solid, firm, and χρῶμα, color).

Water-glass, as its name implies, is a liquid glass. It is not mixed with the pigments — except occasionally, for retouching — but is applied to the finished picture painted with colors dissolved in pure water — by means of a sprinkler. In fact, it is a "fixative," and the process corresponds in principle to that of fixing a charcoal drawing. The colors, when dry, have but little consistence, and would speedily be brushed or washed away were they not firmly bound together by the hard, transparent, insoluble water-glass. Of this there are four kinds.

(*a*). *Potash Water-Glass.* A mixture of: —

15 parts of pulverized quartz, or pure quartz sand,
10 " well-purified potash,
1 " powdered charcoal.

These ingredients are to be subjected to a strong heat till they are fused. As much heat is required as is necessary to melt common glass. When cool, it is pulverized and dissolved in about five parts of boiling water, by introducing it in small portions into an iron vessel and constantly stirring the liquid, replacing the water as it evaporates, by adding hot water from time to time, and by continuing to let it boil for three or four hours, until the whole is dissolved — a slimy deposit excepted — and until a pellicle begins to form on the surface of the liquid, which indicates that the solution is in a state of great concentration; it disappears, however, when the liquid is stirred, and the boiling may then be continued for a short time, in order to obtain the solution in the proper state of concentration — when it has a specific gravity of from 1.24 to 1.25. In some instances it will be necessary to dilute it with more or less water. When it has the consistence of syrup it can rarely be used.

The solution is allowed to cool, and left to clear in the well-closed iron vessel. The clear liquid is then decanted off from the deposit into stoppered bottles. For transportation it may be evaporated to a gelatinous mass by constantly stirring the liquid, and then packed into tinned iron vessels. Or it may be solidified by adding one-fourth its volume of alcohol to a concentrated solution, which is deposited after a few days in a solid mass at the bottom of the vessel.

(*b*). *Soda Water-Glass.* This is prepared in the same way as the potash water-glass; but alcohol does not precipitate it completely. There are two receipts for making it. This is the cheaper: —

100 parts of quartz,
60 " anhydrous sulphate of soda,
15–20 " charcoal dust.

When completely saturated with silica it gives, with water, a somewhat more opaque liquid than potash water-glass.

(*c*). *Double Water-Glass*: —

100 parts of quartz,
28 " purified potash,
22 " neutral anhydrous carbonate of soda,
6 " powdered charcoal, or

a mixture of three measures of concentrated potash water-glass with two measures of concentrated soda water-glass will be found to answer for all practical purposes.

The first three kinds of water-glass, when completely saturated with silica, are more or less cloudy, owing to undissolved and very finely divided silica. To deprive them of this opacity, it is sufficient to add soluble silicate of soda and to allow them to stand for about a day, stirring them occasionally. The soluble silicate of soda is prepared by fusing together three parts pure anhydrous carbonate of soda and two parts powdered quartz.

A dust-like efflorescence, after some time, appears upon bodies impregnated with water-glass. It is not obnoxious, but proves rather that the process of hardening proceeds favorably, by which a little alkali is expelled, thus enabling the silica to act more freely; it may easily be removed with a wet sponge. This efflorescence is not identical with that which frequently makes its appearance on damp walls.

The applications of water-glass are various. Mixed with sand-like substances it makes an excellent cement. It imparts hardness to porous bodies, which absorb it, such as vessels of baked clay, plates, bricks, tiles, etc. Which kind of water-glass is best suited for a given purpose is a matter of experiment. Potash water-glass sets more rapidly than the soda with powdered substances, and may impart greater solidity to them, though the difference cannot be considerable. Soda water-glass being more liquid, penetrates more readily into the pores of absorbent bodies. Soda does not combine so strongly as potash, and has a strong inclination to effloresce when combined with the carbonic acid of the air, and one of the advantages of the soda water-glass might be due, therefore, to its parting readily with the silica, and thus accelerating the silicatization of the mass. The double water-glass seems to unite the properties of the other two, and merits preference for the very reason that it contains two bases with which silica combines more powerfully. Water-glass, as applied to mural painting, is its only special application that here concerns us, and will now be briefly described.

The plaster that is applied directly to the wall is of the usual kind, the lime being thoroughly slaked, and sparingly used. Rich plaster does not readily absorb the water-glass, and will sometimes cause it to crack. When it is dry the water-glass is applied to consolidate, and make it adhere to the wall. The application is repeated several times, allowing the surface to dry each time, and continued almost to the point of complete saturation. Soda and double water-glass treated with the soluble silicate of soda, are preferable to potash water-glass, because they are absorbed more easily. They should be diluted with equal parts of water. Owing to the unevenness of the wall the plaster will be thicker in some parts than in others, and it will be necessary to treat these thicker parts with more water-glass in order that the whole surface may be equally saturated. The composition of the second coat is similar to that of the first, though a fine sand may be used, if desired. If too fine, the water-glass is not readily imbibed. Kaulbach preferred a coarse-grained surface that felt to the touch like a rasp. When this second coat of plaster is dry it is sometimes rubbed with a sandstone or iron straight-edge, in order to remove the film of carbonate of lime that has formed during the process of drying, and which would prevent the absorption of the water-glass. A better method is to destroy the incrustation with dilute phosphoric acid (1 part concentrated acid to 6 parts water), brushed over the surface. Phosphate of lime is formed which binds well with the water-glass. When the plaster is thoroughly dry it is impregnated with double water-glass clarified with the soluble silicate of soda and diluted with its equal bulk of water. The operation should be repeated when the first impregnation is dry. Too much water-glass would close up the pores and inconvenience the painter. In that case time will effect a cure, or the pores of the ground may be re-opened by burning alcohol on it. The wall thus prepared may be painted on at once, if desirable. This is not a necessity; delay increases the absorbing capacity of the ground.

Water-glass cement may be used as a substitute for the second coat of plaster. The water-glass is mixed with powdered marble or quartz sand, to which a little dry slaked lime has been added, in such proportions that the cement has the consistency of ordinary plaster. It has certain advantages over lime-mortar. The water-glass is equally spread through the whole mass, so as to ensure equal cementation and silicatization. During the repeated moistening of the picture, no lime will be drawn to the surface and disturb the colors, because no soluble lime is left in the mass; moreover, no incrustation of carbonate of lime will ever form. This cement becomes, when dry, as hard as stone, and at first is non-absorbent. After a few days it acquires the power of absorption, but loses in solidity; hence, the necessity of one or two saturations with the diluted water-glass.

The colors are ground with pure water. The wall should be moistened frequently, to displace the air from the pores and insure the adherence of the colors, as well as to enable the painter to match the tints uniformly. Care must be taken not to wet those parts too much which have already been painted, because the colors are liable to lose their freshness, the water bringing the finest particles up to the surface, which, however, may be brushed away, when dry, with a fine brush. When finished, the picture is fixed, by means of a sprinkler throwing a fine spray, with the fixing water-glass diluted with half its volume of water. The alternate besprinkling and drying is continued till the colors adhere so firmly that they cannot be rubbed off with the finger. If white pocket-handkerchiefs be smudged, it does not prove that the colors are insufficiently fixed, or devoid of durability, for rubbing with force loosens grains of sand, the friction of which detaches more or less color that indirectly stains the handkerchief. The same is true of colors applied *a buon fresco*. Some of the so-called meagre colors, such as black, require more water-glass, which is added by means of a soft brush. The water-glass is not mixed with the colors on the palette, except for retouching. When so much water-glass has been applied to the surface that it remains unabsorbed for a minute, it is better to blot off the excess with blotting-paper, to avoid possible spots.

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[1] Continued from page 197, No. 539.
[2] Dr. Fuchs published his first pamphlet on Water-Glass in 1825.

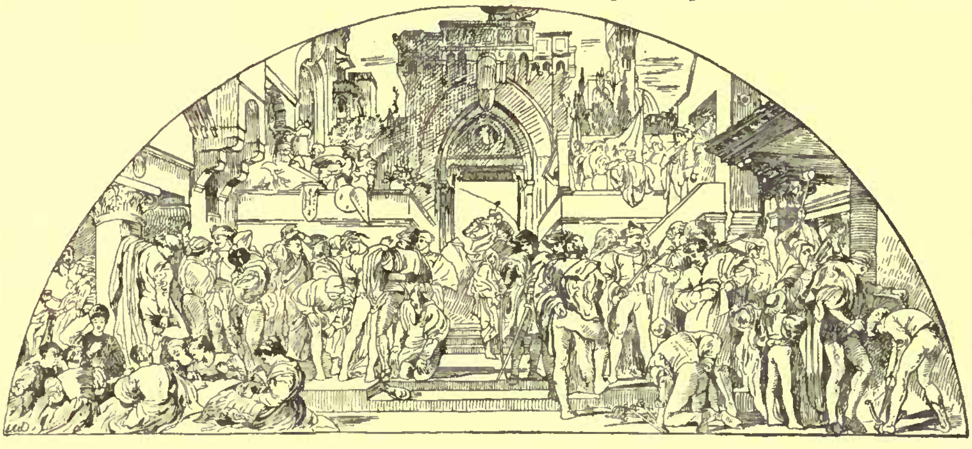
The painting is finished when the colors are fixed. It is well to wash it after a few days with spirits of wine, to remove dust and the little alkali that has been set free, and at the end of a few more days it may be washed with pure water — not spring water. Paintings executed on the outside of buildings should not be exposed to the rain before they are fixed, and ought to be carefully examined at the end of a few months or a year, to ascertain whether they have acquired any power of absorption. In that case, an after-fixing is recommended. Old plastered walls may be used for stereochromy, provided they be dry and sound and the plaster porous after it has been rubbed with rough sand-stone.

Water-glass is more liquid when heated (from one hundred degrees to one hundred and twenty degrees), and is more readily imbibed by porous substances, and, therefore, better suited for fixing colors. The sprinkler may be heated by immersing it in warm water, and the wall-surface by burning alcohol on it, but only after the first fixation of the colors.

A word as to the pigments: No organic color, such as lake, is admissible. The white used is zinc-white, which combines chemically with the water-glass. The colors should be ground as fine as possible. They undergo a slight change by fixing, but acquire their normal tone in time. Cobalt appears much brighter, and light ochre much darker, and are, therefore, not recommended. The colors when fixed do not shine.

Maclise, who made many experiments with water-glass both in England and Germany, and who gained much information from Kaulbach and other practitioners, says that the porosity of the plaster does not necessarily result from the coarseness of the sand, and was assured by the artists most conversant with stereochromy that any remarkable coarseness of the surface was by no means indispensable for insuring the absorption of the water-glass. The roughness or smoothness of the ground was entirely optional. They also stated, in disagreement with the recommendations of the discoverer, that it was not necessary to saturate the plaster with the water-glass previously to painting on it, but that a final fixation of the picture with the fluid sufficed. Such plaster as is used for *buon fresco* they deemed to be sound enough in itself; and on such a ground Maclise saw the artists' work in Berlin. But it should be smoothed with a wooden float, and not rubbed with an iron trowel, as in fresco, a process that brings the lime to the surface, rendering it non-absorbent, and, consequently, subjecting the colors to the risk of flaking.

The process being new, was at first necessarily tentative. Additional experiments revealed new facts or modified old ones. In a letter dated September 14, 1860, Pettenkofer thinks that the potash water-glass is quite safe, and less liable to effloresce than the soda water-glass. In another letter he recommends a ground of Portland cement. The first coat is composed of three parts of coarse sand and one part of cement. This surface, when still fresh, is covered with a thin coat of a finer mixture — three parts of fine sand to one of cement — from one to two-twelfths of an inch. When the upper layer has sufficiently sucked, sand is thrown against it. After a quarter of an hour the sand is removed with a sharp-edged iron ruler, together with the crust of the mortar. Then more sand is thrown against the surface, which, when dry, is sprinkled with a saturated solution of carbonate of ammonia in water. Kaulbach painted a stereochromic picture on a ground of Portland cement and sand in the Dominican Monastery at Nuremberg. Maclise tried it, but apparently did not like it. It will be seen that the original process, as invented by Fuchs, has been much modified in practice. It is not impossible that to some of these modifications may be attributed the partial failure of the water-glass process to fulfil its high promise. Maclise recommends several colors of the organic class prohibited by Fuchs; but I should think that the latter was in the right.



"The Industrial Arts applied to War." From the Spirit-fresco, by Sir Frederick Leighton, in the South Kensington Museum.

THE KEIM PROCESS.

This "is based on the stereo chrome process of Schlotthauer and Fuchs, differing, however, from that in such important particulars as to constitute, practically, an entirely new process in itself. In the year 1818, Professor Schlotthauer, of the Munich Academy, who had for some time been engaged in experiments with a view to discovering some permanent process for mural paintings, turned his attention to the substance known as water-glass (silicate of sodium), the invention of the chemist Fuchs. The result was the adoption of the stereochrome process. In this process the surface to be painted on consisted of an ordinary mortar of lime and sand, impregnated with water-glass. Upon this surface the painting was executed in water-color, and was then fixed by water-glass. . . . In practice, it soon became evident that a simple spraying of water-glass, applied to heterogeneous pigments, without reference to their peculiar properties as regards chemical composition, cohesive capability, etc., was not sufficient to insure their permanence; certain colors in particular, as ultramarine, umber and black, were observed to be always the first to detach themselves, in the form of powder, or by scaling off from the painting, thus pointing to the fact that their destruction was not owing to any accidental defect in the manner of their application, but to some radical unsuitability arising from the chemical conditions of the process."

It would be unjust to the memory of Fuchs, not to state that the painters often neglected to follow his precepts. He particularly emphasized the necessity of saturating the plaster ground with water-glass; but neither Maclise nor the German artists whom he consulted deemed it necessary to follow this injunction. It is not impossible that their neglect may have had something to do with the ultimate decay of the pictures; unfortunately, there are no data on which to base an opinion. The exact nature of the grounds on which the pictures were painted, as well as their actual condition should be precisely known in order to come to an authoritative conclusion. Fuchs, moreover, attributing the failures, that were at first frequently made, to the upper layer of plaster, recommended as a substitute the *water-glass cement*, previously described. This he deemed more reliable than the plaster; yet it does not appear to have been used as a ground for mural paintings. Again: he insists that the "meagre colors, like black" — the very colors that "were observed to be always the first to detach themselves" — require more water-glass, which should be added with a fine brush. He even thinks it would be well the mix the water-glass with such colors. Perhaps this injunction, too, was violated.[1]

Keim suggests several innovations in the preparation of the wall. If this be already covered with plaster, it will serve for the first coat, provided it be sound and dry. If not, the bricks must be laid bare, and the plaster between them picked out to a depth of about three-fourths of an inch. On this surface, a thin squirting is cast, composed as follows: —

4 parts of coarse quartz sand, infusorial earth and powdered marble, mixed in certain proportions (?) to
1 part of quick-lime, slaked with distilled water.

Upon this squirting-cast follows plaster of the ordinary consistence, and composed of the same ingredients. On this, again, a third or painting ground is laid, not exceeding from one-eighth to one-quarter of an inch in thickness. This last coat is composed of 8 parts of the finest white quartz sand, marble-sand artificially prepared, and free from dust, marble meal and infusorial earth in the proper proportions (?) to: — 1 part quick-lime slaked with distilled water.

For works executed on the exterior of buildings, pumice-sand is recommended in addition to the other ingredients. A wall thus prepared "presents so hard a surface as to admit of sparks being struck from it with a steel." Only distilled or filtered rain-water should be used in this process; for should the water contain lime it would affect the fixing-solution to the prejudice of the painting.

When the plaster is thoroughly dry, it is treated to a solution of hydro-fluo-silicic acid, to remove the thin crust of carbonate of lime. It is then saturated with two applications of potash water-glass diluted with distilled water, and when dry is ready for painting. The grain may be coarse or smooth according to the artists' taste; but the smoother the ground, the less absorbent it is, and the more difficult the fixing. If desired, the ground may be prepared in any tone, and all those colors may be used that are suitable for the stereochrome process. These are, for the most part, the natural earths and metallic oxides. Every color should remain chemically unaffected by the ground, by the other colors in contact with it, or by the fixing material. "To meet this end, the colors in this process are treated beforehand with alkaline solutions (of potash or ammonia), to anticipate any change of hue which might result from the use of the alkaline liquids which form the fixative. In addition to this, they are

[1] Mr. Otto Grundmann, Instructor in the School of Drawing and Painting, Boston Museum of Fine Arts, worked for some time in water-glass, with Godfried Guffens and Jan Swerts of Antwerp, in the Church of St. Nicholas, Ypres, about nine years ago. They did not prepare the plaster ground with water-glass, nor did he think that these mural paintings had deteriorated. The same artists had executed other works in water-glass, and were well satisfied with the process. Mr. Grundmann says, that "blacks and blues are treated like other colors, and that a second coat of water-glass *may* be used [over the whole picture] if the first should not be enough." He saw the works of Kaulbach in water-glass at the National Gallery of Berlin. The "History of the Reformation" was overspread with cracks, not long plaster cracks, but short cracks, such as are developed on oil paintings. It had not, however, grown dark. The exposed frescos on the outer walls had greatly suffered.

further prepared with certain other substances, such as oxide of zinc, carbonate of baryta, felspar, powdered glass, etc., as required by the peculiar properties of each, in order to obviate any other danger of chemical change taking place. . . . From the various nature of the properties possessed by some of the pigments, it was found that their capacity for absorbing the alkaline silicate with which they were fixed varied very greatly. There was also a marked difference in the degree of mechanical cohesive capacity, which they respectively possessed. To equalize them in these respects, without which the fixing would have been a work of great difficulty and uncertainty, alumina, magnesia and hydrate of silica were added as required. The result was that all the colors are equally acted upon by the fixing solution, and all attain an equal degree of durability after fixing, both as regards the mechanical and chemical action of this process upon them. In the year 1878, a large mural painting was executed by this process on the exterior of the parish church at Eichelberg, near Regensburg. Before its completion, and therefore before any of the fixing solution had been applied to it, it was drenched by a heavy storm of rain. Contrary to anticipation, it was found that the painting, so far from being in any degree washed away, had held perfectly firm, and even in some places seemed to be as hard as if already fixed. Mr. Keim's explanation of this unexpected result, which he subsequently confirmed by experiments, was that a chemical cohesion had already taken place by the action of the alkali, set free in the mortar, upon the silicates in the pigments."

The preparation of the colors and the fixing glass is apparently a complicated process, and demands the services of an expert. But the artist would be freed from all such complications, and for him the process would be very simple. He can paint thinly or with impasto, and retouch *ad libitum.* It is to be observed, however, that pigments applied thinly can be more securely fixed than impasto, and are therefore likely to be more durable. (But impasto is also more liable to perish in the other processes, not to mention its tendency to collect dust. Yet at times it is too effective to be discarded, especially in combination with rich materials.) The palettes are constructed with small pans to hold the colors, of which the residue, at the end of the day's work, may either be replaced in the bottle or kept moist in the pan with distilled water.

"The last stage in the process is the work of fixing. In the stereochrome process the fixing medium employed was silicate of potash, thoroughly saturated with silica, in combination with sufficient sodic silicate to prevent it from opalescing. The chief defect of this lay in the fact that it was often apt to produce spots upon the painting. Mr. Keim has substituted silicate of potash, treated with caustic ammonia and caustic potash. The action of the carbonic acid in the atmosphere and in the water during the process leads to the formation of carbonated alkali, which makes its way to the surface, and would form, when dry, a whitish film over the painting. To obviate this danger, as well as to expedite the process of converting the silicate of potash, with the basic oxides existing in the substance of the painting, into silicate, the fixing solution is heated further with carbonate of ammonia. The effect of this upon silicate of potash is that silica is precipitated in a fine gelatinous form, and ammonia set free. This latter volatilizes, and carbonate of potash is formed, which is easily removed by washing, after the completion of the fixing. The fixing solution is employed hot, with the advantage of obtaining a quicker and more perfect formation of silicate than was possible in the stereochrome process, where the solution was applied cold. The effect of the fixative as it sinks into the ground, which has already absorbed the pigments, is to convert the painting into a veritable casting, uniting with colors and ground in one hard, homogeneous mass of artificial stone. The finished painting has proved itself impervious to all tests. It will admit of any acid, even in a concentrated form, being poured over it (save, of course, hydrofluoric acid)." It has other applications than that of mural painting. For house-painting it is claimed that it would last as long as the house itself, only needing an occasional scrubbing; it would also form an excellent protection against damp. Taking its durability into consideration, it is not more expensive than other systems.[1]

There is much in the preceding paragraph, where comparisons are instituted between the Keim and Fuchs processes, to which exception may be taken. As we have seen, the latter did not recommend the potash water-glass for painting. This was an innovation introduced probably after the death of Fuchs (1856); for Prof. Pettenkofer recommends it as a substitnte for the soda and double water-glass (in 1860) "which is apt to come up to the surface of the painting." (An unobjectionable efflorescence, according to Fuchs, and easily removed.) Pettenkofer also counsels the use of caustic potash with the water-glass for fixing, in the proportion of one to fifteen, except for black, cobalt, and chrome red. The fixing solution may have been "applied cold in the stereochrome process," but contrary to the recommendation of Fuchs, who is very explicit with regard to the heating. Though the Keim is undoubtedly an improvement over the earlier processes, yet it evidently has not been compared with that of Fuchs, but with a less laborious one — and probably less secure — substituted by impatient practitioners. This is worth noting, as indeed is everything bearing on the decay or preservation of mural



From the Frescos by Julius Schnorr, in the Royal Palace, Munich.

paintings. It is to be deplored that there is no detailed, authoritative, and accessible statement of the actual condition of all the important water-glass paintings executed thirty or forty years ago. Very likely many of them are still sound.

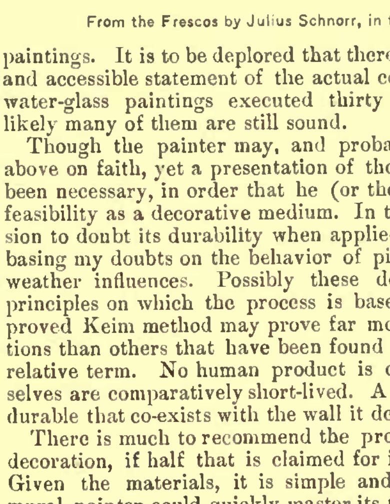
Though the painter may, and probably must, take much of the above on faith, yet a presentation of the principle of water-glass has been necessary, in order that he (or the architect) may judge of its feasibility as a decorative medium. In the second paper, I took occasion to doubt its durability when applied to the exterior of buildings, basing my doubts on the behavior of pigments exposed to sun and weather influences. Possibly these doubts are ill-founded. The principles on which the process is based seem logical, and the improved Keim method may prove far more durable in exposed situations than others that have been found wanting. Durability is but a relative term. No human product is everlasting. Buildings themselves are comparatively short-lived. A painting may fairly be called durable that co-exists with the wall it decorates.

There is much to recommend the process as a medium for interior decoration, if half that is claimed for it by men of repute be true. Given the materials, it is simple and direct; so simple that any mural painter could quickly master its technicalities. Like fresco, it is without gloss, though probably less luminous. It apparently possesses all the requisites for monumental painting on the wall.

FREDERIC CROWNINSHIELD.

[To be continued.]

THE WOOD ARCHITECTURE OF THE NORTHERN HARTZ.



TOMB. M. POTTIER ARCHT.

WOOD, as a medium of external construction, is practically a thing of the past throughout nearly the whole of western and southern Europe. With us in America a cheap house is generally assumed to be one that is built of wood throughout; whereas in Europe stone and brick are so universally employed and relatively so moderate in cost that to be the possessor of a wooden house implies a certain disregard of expense, and a desire to excel one's neighbors. In the ordinary houses wood is used very sparingly, even for the internal structural arrangements, the framing of the floors being composed of squared logs spaced some distance apart, in distinction from the deep and narrow floor-beams generally in use with us, the European method permitting the use of smaller trunks for building timber than would be available with our own construction, though the actual amount of wood used is about the same in either case. Three or four centuries ago the conditions were different. The north of Europe was still largely covered with forests, from which the inhabitants drew abundant supplies of oak and pine answering for every requirement of private building operations. It may be questionable whether the common houses of that period were not better suited for human habitations than the brick or stone and stucco structures which have succeeded them. However that may be, masonry appears to have been very little used. As the forests were cleared away, however, the wood architecture

[1] Condit, referring as a house-painter to certain ready-mixed pigments, of which water-glass (silicate of soda) is one of the ingredients, says that he "has seen such a paint in nearly perfect condition after ten years, a portion protected by a building being in an absolutely perfect condition, with a fine lustre. Some of the paint, however (probably too little oil), would crack and peel in the worst manner, the paint curling like a dried leaf. This, I am told by an old painter who has used these paints for ten years, it was specially and decidedly prone to do, if (1) any break, however small, occurred, the water seemingly shelling it off, either directly or by expanding the wood; (2) if placed over or under a lead and oil paint. We have, probably, here one of the best illustrations of the theory and fault of a good paint. It is hard and therefore durable, preventing even white lead from 'chalking' for nearly a dozen years. But as it contains too much hardening substance for its little amount of oil, it is too hard, has no elasticity, and cracks badly; moreover, the oil does not penetrate the wood (water-glass goes into the wood), and, by reason of this and the small elasticity, destruction is rapid and fatal, whenever it begins, as it *may* soon."

Such pigments and their application differ widely from the pure water-glass process; but even the behavior of these hybrids is not without its lesson.

began to lose favor with the common people, until now, even on the borders of some of the remaining large wooded tracts, the peasants generally prefer to build their houses with stone, rather than to help themselves to the forest timber. Possibly we in America may find ourselves in the same condition ere long. We are now practically the only civilized nation which builds wooden houses. Our forests are by no means inexhaustible, and a change is sure to come eventually, though the present generation is hardly likely to see it. But we have not built our last wooden house yet, and hence while our methods and plans are in many respects radically different from those followed in northern Europe, during what might be termed the wooden period, it may be worth while to study the old styles, especially as the modernizing tendencies of this century are rapidly doing away with what little wood architecture is left in Europe.

Italy never had any wood architecture, as such, and France very little, if we may judge by the few remains scattered through Normandy. Only in Germany was the use of wood at any time in general favor for private use. The existing examples may be broadly classed in three groups; first, those of the Rhine provinces; second, those of Swabia, the Black Forest and Thuringia; and third, those found in a narrow tract of country northward of the Hartz Mountains. In the first district, stucco has been used so freely that little can be gained by a study of the buildings aside from occasional picturesque suggestions for general effects, as the construction is entirely hidden, and except for the widely overhanging upper stories there is nothing to distinguish the building as having a wooden framework. In the second district, the construction is shown very plainly with what we would call half-timbered work; but the projections are very slight, the upper stories often being on a line with the lower, and there is no attempt at anything more than a plain, square-timbered construction. In the northern Hartz, however, there is a great deal to be studied. The construction is better and more rational than that found elsewhere, and with the use of dormers and bay-windows, effective carvings and mouldings, a complete style has been developed, very consistent with its wooden origin, being always an ornamented construction in all its details, and generally having a very picturesque effect, with a considerable amount of delicacy at times in the details of execution. Much of the same sort of work must have been done in other parts of Germany, but it has so nearly disappeared that as far as any purposes of study are concerned, all of the good woodwork of the country is found in the northern Hartz, and not very widely scattered, either, as the three cities of Hildesheim, Halberstadt and Brunswick are the only ones in which the old work has been allowed to remain unmolested.

Perhaps it is hardly just to designate these cities as being in the northern Hartz, for the mountains are really so small that even at Hildesheim the foot-hills have sunk away into mere hillocks, while Brunswick lies in a broad plain. But geographically the district would be classed with the Hartz Mountains, and for lack of a better distinction the style may be designated by the name of the locality from which the material of construction was drawn.

Hildesheim is a typical old German town, unmolested by nineteenth-century progress, remaining just as it was three or four centuries ago, with narrow, irregular streets continuously lined with the quaint old woodwork—scarcely a dozen dwellings built of masonry in the whole town, if we except the narrow quarter lately sprung up about the railway station. There is hardly a city in Europe which has so fully preserved its mediæval aspect, and that, too, without stagnating, for Hildesheim is a lively, bustling place in its way, and has considerable of interest besides the wood architecture. The houses are all very much alike in arrangement and detail, and can perhaps be best illustrated by the example shown on the sheet of sketches; an old house facing one of the small squares in the centre of the city. With slight variations of ensemble this type is repeated indefinitely throughout the city. The construction is so straightforward that it shows in nearly every feature of the outside. The frame is of solid timbers, six to nine inches square, starting from a wooden sill on a rubble-stone foundation. Rarely there is a masonry lower story or an open passage such as that under the house shown by the sketch. The uprights are spaced regularly three to four feet apart, and framed into a sunk girt, or more properly a plate that receives the upper floor beams, each story being framed independently, with none of the timbers extended the whole height of the building. The beams for the second floor are spaced to correspond with the vertical timbers, and are projected over the face of the lower story, the projection rarely amounting to more than the width of the beams. Along the outer edge of the floor-beams is laid a sill into which are framed the verticals for the story above. The wall-spaces between the timbers are filled in with brick flush to the faces of the timbers, inside and out, and are covered with stucco. Only rarely are wooden panels employed. Diagonal bracings are never introduced, nor is there any special framing for the windows, which often have the appearance of being simply built in at the same time as the brick filling, though sometimes, as in the example sketched, horizontal bands are carried across the front of the house on the lines of the window-sills.

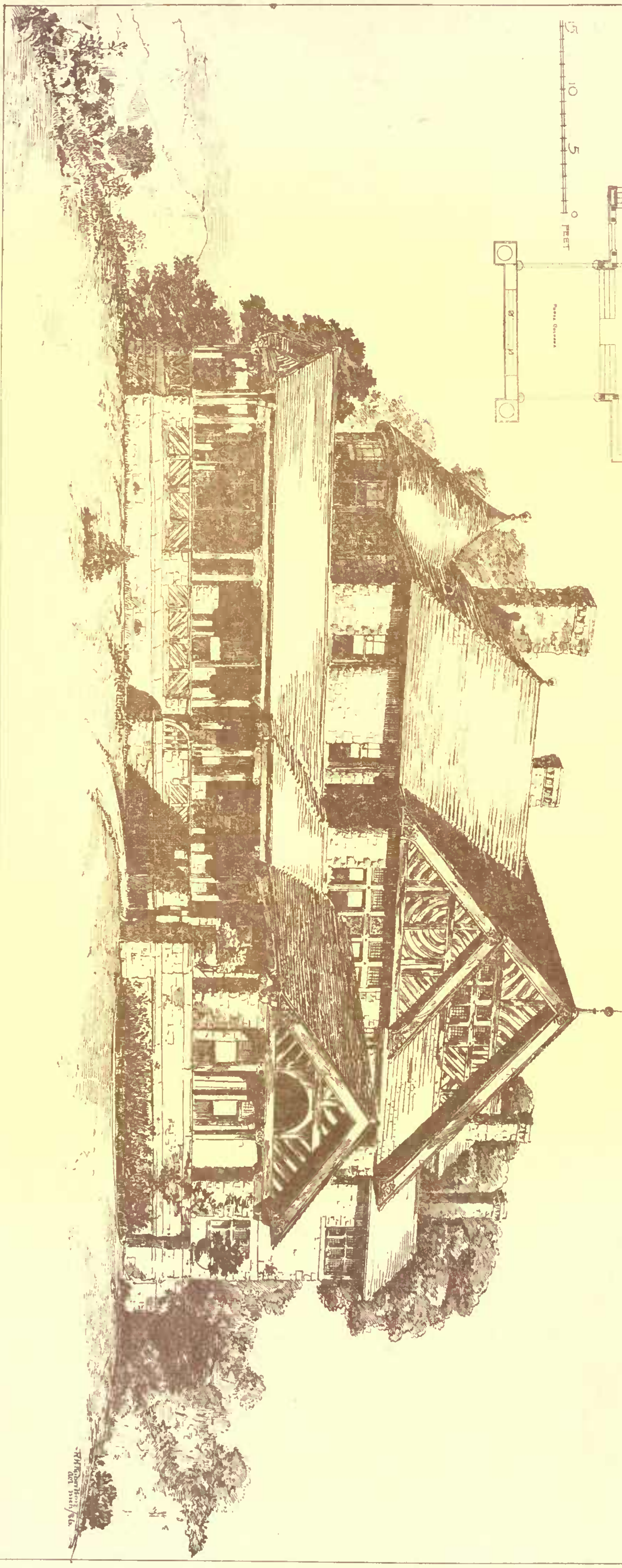
The ornamentation of the work is as simple as the construction, and is confined to plain brackets under the projecting beams, a facia and a few heavy mouldings beneath the overhang, and some simple carvings on the faces of the upper sills. In the work at Hildesheim the beams are not chamfered at all, and the general character of the style is so very structural that it would seem to be of an earlier date than what is found in the other two cities. Hildesheim is always picturesque and interesting in its old buildings, even though they are built so nearly on the same model. None of the houses are at all pretentious as to their ornamentation, but what there is in that respect is generally bold and effective, and suited to the climate and the materials. It is hard to fix any date for this work, as the same style was in favor for two hundred years or more; but it is doubtful if any structures of this kind were erected later than the sixteenth century.

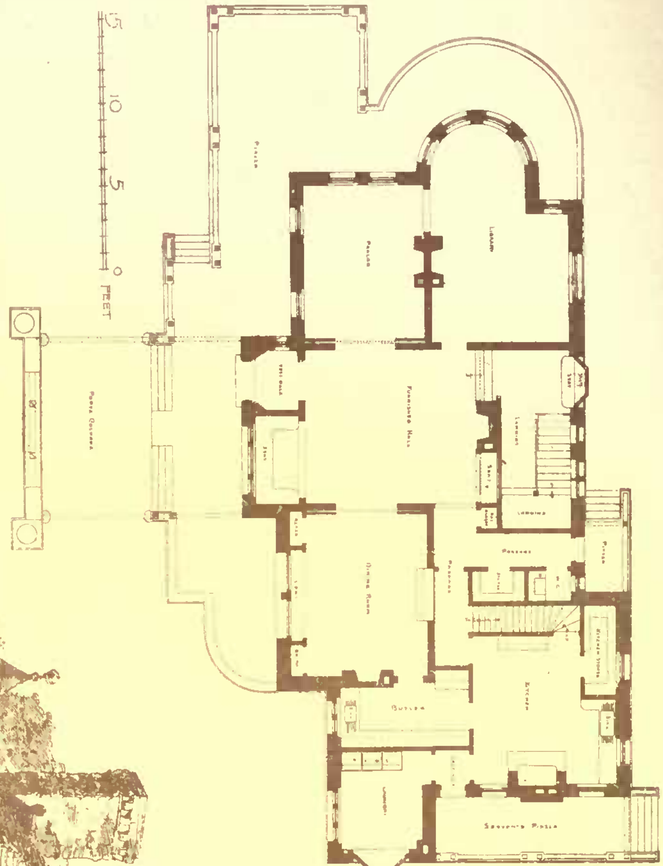
Although the style used is essentially the same in Hildesheim, Halberstadt and Brunswick, each city presents certain well-defined characteristics. Thus, as we have noticed, chamfers are very little employed in the work at Hildesheim. In Halberstadt, on the contrary, nearly every overhanging, horizontal timber is moulded and chamfered. The projections, too, are greater, and wooden-carved panels are introduced. The three details shown on the sheet of sketches will illustrate the character of the work in this city better than could be done by a general view of any one building; indeed, in Halberstadt the *ensembles* are not especially pleasing as a rule, perhaps because the city is more enterprising than its neighbor and has seen fit to make over some of the old work. The most pleasing part of what remains is the detail. The city is, by comparison, disappointing to one who looks for the picturesque. The principal street and the market-place are built up with old timber houses, most of them gaily painted in reds, browns, and yellows, not always in harmony with the rather sober character of the designs, nor any decided improvement on the dull tones of the work which has had only time and the weather to color it. The houses do not seem to group to any advantage; why, it would be hard to say, for nearly all the individual features are pleasing of themselves, as detail. The large, half-circular rosettes, if such they may be called, which are shown on two of the sketches spaced along the upper story corresponding with the brackets and carved in broad, vigorous strokes, constitute a very pleasing feature, and one which must have been greatly in favor with the old builders, if we may judge by the number of times it has been used. The double, or even triple, rows of beams at the floor level is a usage which is not found to any extent in the other cities. The construction in such cases is essentially the same as that at Hildesheim except that an impost block is often introduced between the wall-plate and the projecting floor-beams, to give additional stiffness to the frame. It is noticeable that in both cities the large brackets under the projecting floor-beams really count for nothing in most cases as far as actual support is concerned. The entire construction is on the rectangular-bay system, no diagonals of any sort being made use of, unless the panels of the kind shown by the sketches may be called braces, though practically they do not act as such.

In Brunswick the work shows another step; whether backward or forward would be difficult to say, for it has not the simplicity and general picturesqueness which is found at Hildesheim nor the interesting structural details like those of Halberstadt; but on the other hand the old wooden buildings of Brunswick are ornamented with carvings of a quality and profusion which make the work of the other cities seem crude and unstudied to the last degree. Two examples are given on the sheet of sketches. The Wolter's Haus is a long building now occupied by an extensive brewery, with shops on the ground floor. It has been restored to a considerable extent and painted in a very ambitious manner, but without altering its main lines or interfering with its enriched details. The façade repeats itself for about a hundred feet after the style of the portion shown in the sketch; and although the details are the most interesting feature of the design, the general effect is by no means bad, and is rather helped out by the long, simple roof. It may be said, by the way, that in this city the houses seem to have been built by preference with the side to the street, so that the broad gable does not appear as a part of the general scheme. The second example sketched is a portion of a house on the street bearing the euphonious title of "The Sack." It is probably the richest piece of German woodwork in existence, and fortunately is in a state of almost perfect preservation, every detail being as sharp and clearly-defined as though cut in granite; indeed, it is doubtful if any stonework would look as well after three hundred years of exposure as this does. The material appears to be oak. The entire façade is about forty feet wide. The roof line is broken only by the dormer over the portion sketched, and the rest of the front is on the same scheme as that which is shown, but with different carvings throughout. The filling between the timbers is brick smoothly covered with stucco and serving to heighten the effect of the carvings by the sharp contrast between the smooth white and the strong brown tone of the woodwork. The lower story, or story-and-a-half, is evidently a modern alteration in a different style from that of the superstructure.

The difference between this example and the one sketched from Hildesheim is very obvious, and a comparison of the two will make clear the changes this style of building underwent. In the earlier example there is nothing more attempted than a simple, straightforward construction, the ornament being applied very sparingly and in such limited quantities that it is lost sight of in considering the general effect. The picturesqueness which makes the ruder style so pleasing, is doubtless a result of hazard as much as of deliberate intent on the part of the builders. In Brunswick, on the contrary, the construction loses a great deal of its straightforward character, and the carving is applied indiscriminately to every inch of exposed wood surface. The use of the diagonal braces each side of the

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HOUSE FOR J. M. TOUCEY ESQ AT GARRISONS ON HUDSON, N.Y.

R. H. ROBERTSON } ARCHITECTS,
A. J. MANNING, } Associated.

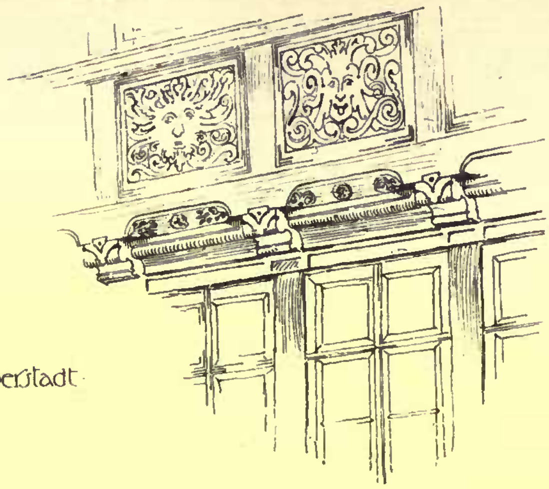
The Heliotype Printing Co. Boston.

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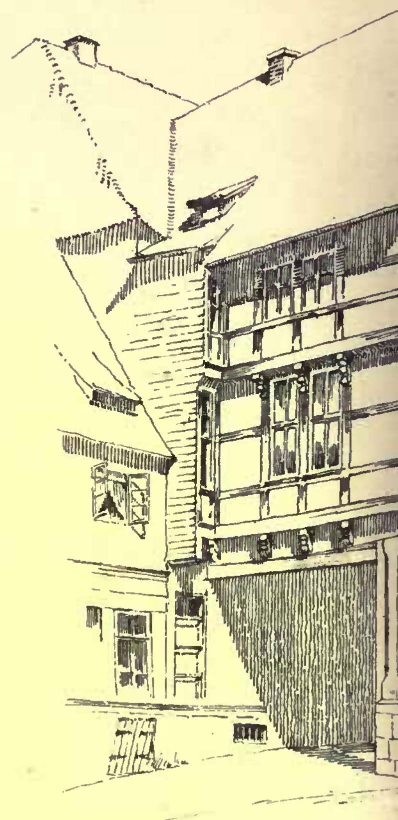


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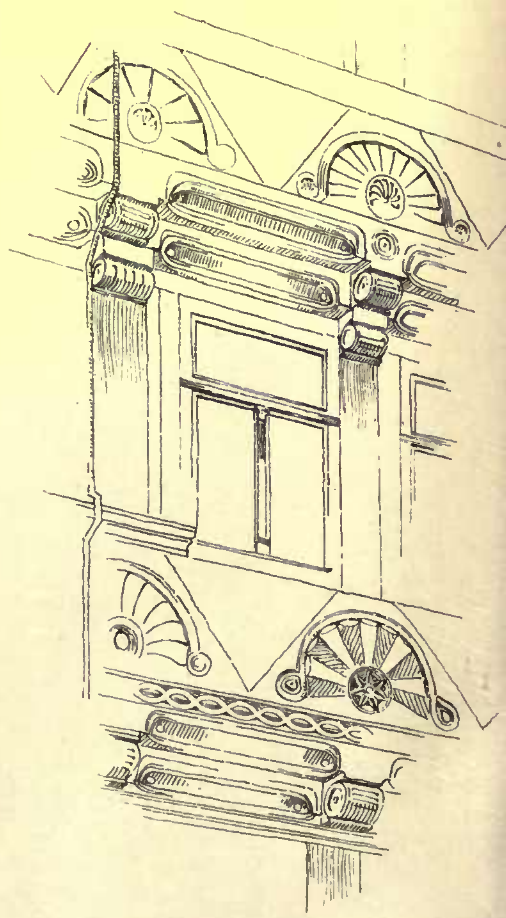
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Halberstadt.







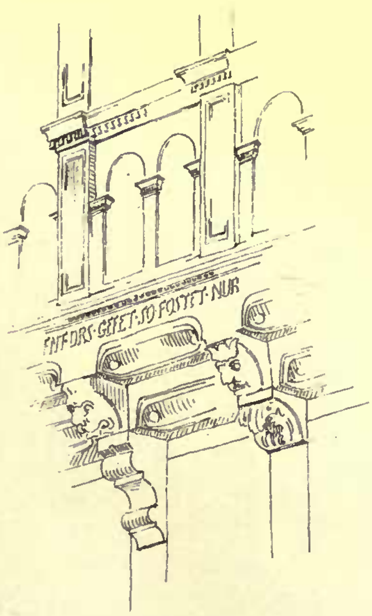
·Wolters' Haus·
·Brunswick·

Wood Architecture of the Northern Harz Germany

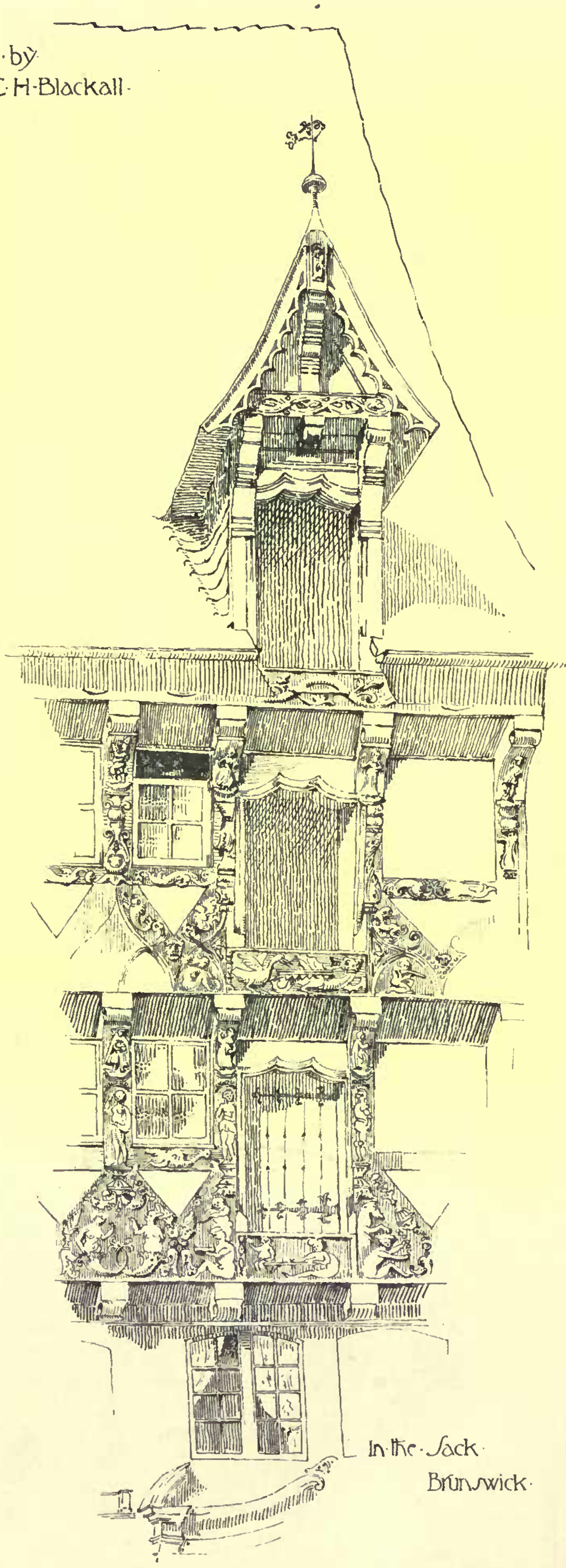
Sketched by C. H. Blackall



Andreas Kirch Hof Hildesheim



berstadt



In the Sack Brunswick

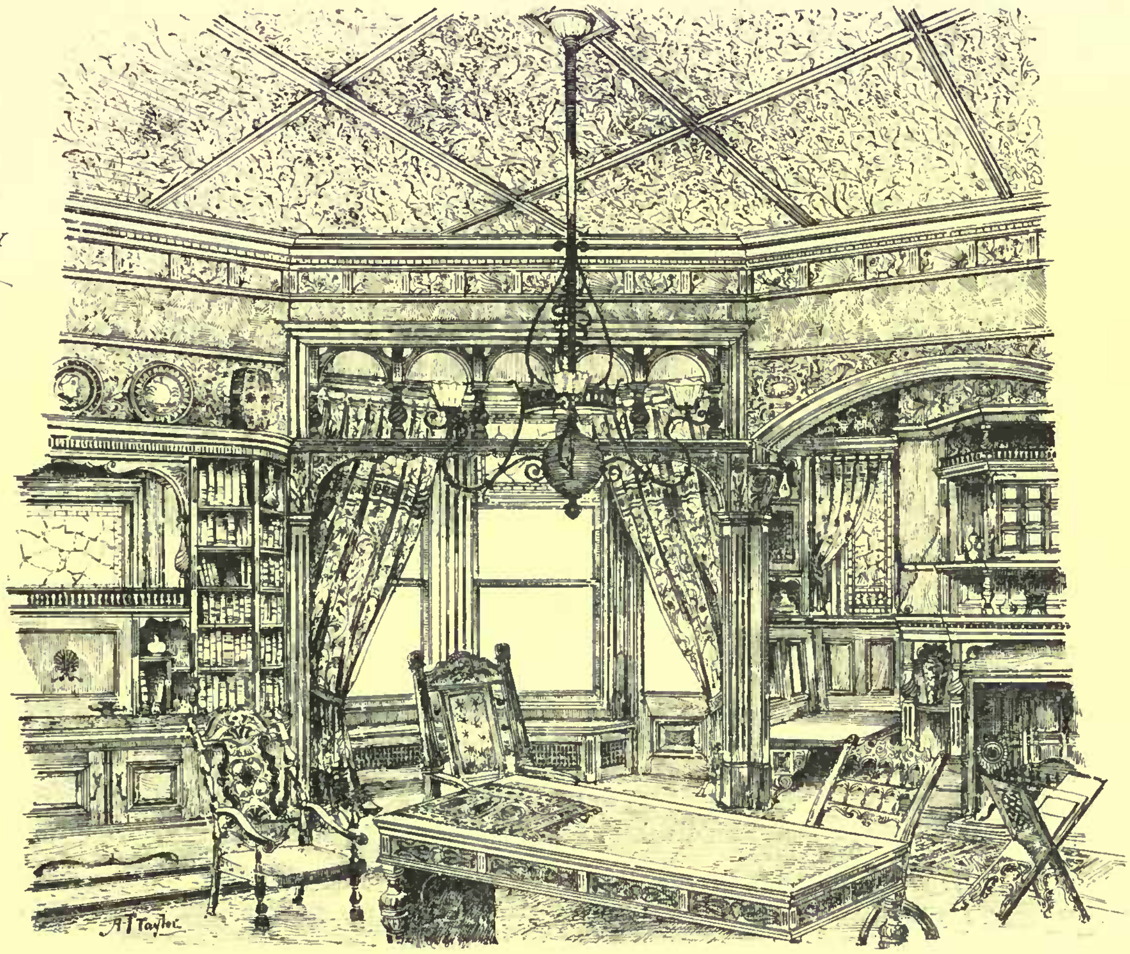
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House at Ottawa, Canada. for Mr. W. H. Davis.

C. C. Taylor. Gordon & Bousfield. Architects, Montreal.

In the Library

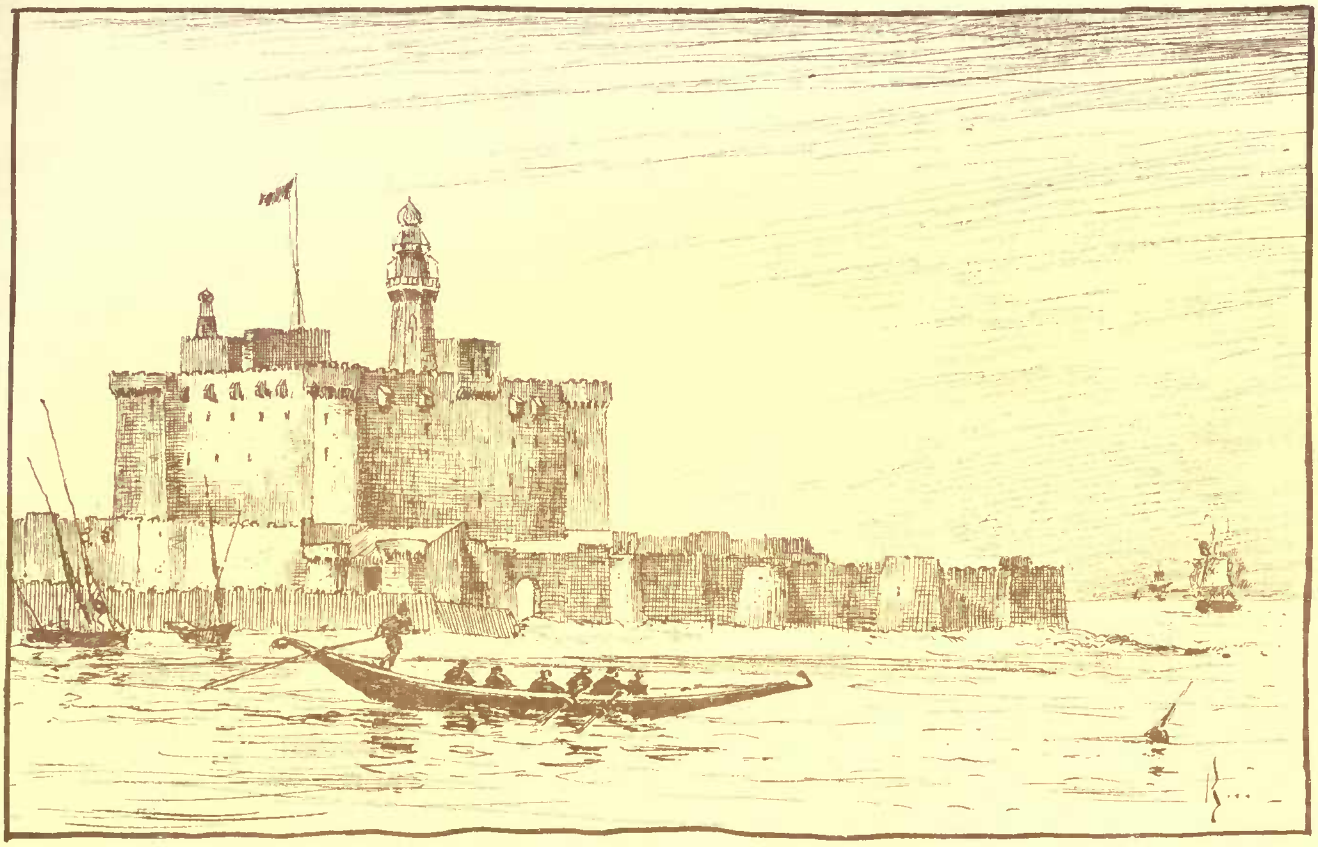




The Staircase

Heliotype Printing Co. Boston

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MODERN LIGHT HOUSE OF ALEXANDRIA ON THE ISLAND OF PHAROS.



ANCIENT LIGHT HOUSE OF ALEXANDRIA ON THE ISLAND OF PHAROS.

uprights and under the windows, gives an excellent field for figure carving and elaboration, but the way in which obliques and uprights, as well as the connecting horizontal timbers, are treated as one surface, is not altogether pleasing from an æsthetic standpoint, however satisfactory the carvings may be of themselves. Hildesheim might be called the work of an architect, while the house in Brunswick is the work of a wood carver who was blessed with an overflowing abundance of ideas.

There is one feature about all of this woodwork — a feature, for that matter which seems to be common to nearly all German architecture, ancient and modern. The chimneys are nearly always in the centre of the building and never count for anything as a part of the general design. It is a rather singular fact that in Germany, a country of cold winters, the chimneys should be disregarded in the same manner that they are in Italy, the land of perpetual sunshine; while in France and England they have always been important factors in the design of nearly every class of buildings.

There is a great deal of good woodwork in Brunswick, none of it as rich as the house in the Sack, but much in the same spirit. There is a great picturesque pile, known as the "Weigh House," which has been restored and repainted in all sorts of strong colors. Fortunately, the house in the Sack has escaped a like fate, and looks infinitely better with only its clear, brown, old oak tones. Then there is one whole quarter of the city whose streets are lined with nothing but old timber houses of all descriptions and in various states of repair, generally, however, the worse for wear, as the average German does not prefer to inhabit a house three hundred years old.

The distinction in style between the buildings of the three cities is, of course, not always rigidly adhered to. There are bits of over-ornamentation in Hildesheim as well as of unadorned construction in Brunswick; but generally considered, the building sketched will serve as types of the work in these cities, and may be taken as fairly illustrating the style of architecture. C. H. BLACKALL.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

ROOD-SCREEN IN ST. PETER'S, LOUVAIN.

[Gelatine print issued only with the Imperial and Gelatine editions.]

HOUSE AT OTTAWA, CAN., FOR MR. W. H. DAVIS, THE STAIRCASE AND THE LIBRARY. MESSRS. TAYLOR, GORDON & BOUSFIELD, ARCHITECTS, MONTREAL.

THE two sketches show interior views of staircase and library of a house recently erected at Ottawa, for Mr. W. H. Davis. The house stands on a commanding position overlooking the Rideau River. Externally the house is built of local limestone and red brick, with a little half-timber and ornamental plaster-work, red tiles and terra-cotta.

The internal furnishings of the public rooms are in hard-wood, the entrance-hall and staircase being of oak. The aim was to get good effects, both of grouping and of lines, at a very moderate cost.

The architects are Messrs. Taylor, Gordon & Bousfield, of Montreal, under whose superintendence the work has been carried out.

WOOD ARCHITECTURE OF THE NORTHERN HARTZ, GERMANY. SKETCHES BY MR. C. H. BLACKALL.

SEE article on "The Wood Architecture of the Northern Hartz," elsewhere in this issue.

COURT-HOUSE, CLARION CO., PA. MR. E. M. BUTZ, ARCHITECT, ALLEGHENY CITY, PA.

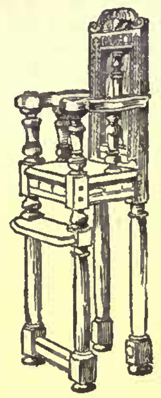
HOUSE FOR J. M. TOUCEY, ESQ., AT GARRISONS ON HUDSON, N. Y. MESSRS. R. H. ROBERTSON AND A. J. MANNING, ASSOCIATED ARCHITECTS, NEW YORK, N. Y.

ANCIENT LIGHT-HOUSE OF ALEXANDRIA, ON THE ISLAND OF PHAROS.

MODERN LIGHT-HOUSE OF ALEXANDRIA, ON THE ISLAND OF PHAROS.

DEATH OF A NOTED ARCHITECT. — Supervising-Architect Gerwig, born at Carlsruhe, in Baden, May 2, 1820, is dead. He was one of the foremost men in his profession, holding the position of chief of the building department and head of the technical section of the general management of the railways of Baden. The Black Forest Road was his work, as also were the primary plans for the St. Gotthard Road. From 1874 to 1884 he was a member of the German Reichstag for the Second District of Baden (Donau-Eschingen).— *Chicago Tribune.*

THE ERECTION OF COLOSSAL STATUES.



Child's Chair XVth Cent.

A PAPER on this subject was read March 3, before the members of the Civil and Mechanical Engineers' Society by Mr. George Simonds. He pointed out that the colossal statues erected by the ancients seem to have vastly out-numbered those erected in modern times, as well as to have considerably surpassed them in magnitude. From the sculpture of the British Museum we obtained a good idea of colossal works of Egypt and Assyria, and also those of Greece and Asia Minor. While many immense statues of marble and stone have survived from periods of the most remote antiquity, almost every statue executed in bronze has perished. The Colossus of Rhodes was designed by the architect Chares. The height was probably one hundred and thirteen feet, and the length of the sides of the equilateral triangle, formed by the two legs which bestrode the opening into the harbor, should, according to the Greek laws of portion, have been fifty-six and one-half feet, a quite sufficient height for the small vessels of that day.

The statue, Mr. Simonds added, was, in sculptor's parlance, twelve times life size. Its foot must have been about seventeen feet from toe to heel, and the head about fourteen feet from the crown to the chin. Such a foot cast in bronze would, of course, be very heavy, not on account of the exigencies of the casting, but rather because of the great pressure it would have to sustain — little less than one hundred and fifty tons on each foot. At the thinnest part of the ankle this statue must have measured about three feet six inches in diameter. If the weight of metal was correctly reported, the lower parts must have been cast of enormous thickness, for the upper portion would, of course, be cast extremely thin, and for these castings the Greeks have never been surpassed. Many existing fragments show this. There is probably some mistake as to the weight of the metal. Certainly, assuming the weight to be correct, the statue could not have been formed of beaten plates. As to the manner of erection adopted by Chares, we know nothing; but it seems, if the popular legend as to the position of the statue is correct, it must have been a work of no small difficulty. The ancients rarely, if ever, cast colossal works in one operation, but usually cast even works of life-size and less, in pieces, which were joined together with box-joints and rivets, besides being further strengthened with double-dovetail dowels let into the thickness of the bronze, and thus binding one part to another. It seems probable to him that the Colossus may have been erected over a wooden centering between the legs, and built up from the two sides simultaneously until the legs were in place, when the work of erecting the body in sections would be comparatively an easy matter. The authors who described the colossal statues of antiquity do not give much information as to the methods employed in their construction and erection. That their engineering talents were on a level with their artistic conception we may gather from the fact that the Mausoleum of Hadrian was surrounded with a quadriga of such size that, according to Winckelmann, a man could crouch in the hollow of the eyeballs of the horses. If this is true, the horses' heads must have measured at least twenty feet in length, and the horses themselves must have stood over eighty feet high. It seems almost incredible that such colossal equestrian sculptures can ever have existed, and the difficulty of erecting them without modern appliances must have been such as to require, not only accumulated wealth, but engineering powers of a very high order. In the present day, the invention of hydraulic machinery has rendered the erection of works of any kind a comparatively easy matter, and since Mr. Benjamin Baker and Mr. John Dixon have shown the world how simply and easily an Egyptian obelisk may be placed in position, there is little fear that the erection of any statue of whatever size would prove an insurmountable difficulty. Probably the oldest authentic record which remains to us of the methods whereby these vast works were erected is to be found in the sculptures from the Palace of Kouyunjik, now in the British Museum. Some of these bas-reliefs represent Sennacherib superintending the transposition of some colossal winged bulls to their position at the gates of the Palace of Kouyunjik, which was then in course of erection. The monarch stands in his chariot, watching, with evident interest, the exertions of a vast number of slaves who are employed on this work. There is a river at the bottom of the sculpture in one place, and near the bank lies an enormous sculptured bull supported by something which might be either a boat or a sledge, and not improbably, it might have served both purposes. This conveyance, whatever it is, is represented as about to be dragged up a steep incline, the gradient shown in the sculpture at this point being about one in four. Four cables are attached to the fore part of the sledge, and two to the stern, or hind part. These two, I suspect, were used, not so much to give motion to the ponderous load as to guide its course whenever it was desirable to deviate from the straight line.

Two or three men are seated on the recumbent monster apparently directing the operations, whilst a gang of men are placing in position a lever of great length, which was actuated by a number of men hauling down on ropes attached to its end. I cannot say whether this lever is about to be used to raise the end of the sledge, or only

to slew it round; but doubtless it will serve both purposes. The gangs of slaves are all properly harnessed to the cables, each man having his shoulder-strap attached to the main cable by a short rope. Each gang also has a foreman to direct their movements, and a slave-driver, with a whip to urge them on. Besides these, other workmen are employed in laying down, not rollers, but sleepers, for the sledge to travel over. It is clear that they are not rollers, as these would be of little use and of considerable danger in going up so steep an incline. Moreover, they are not round, but irregular, in shape, being apparently rough limbs of trees cut into lengths and split down the middle; they are laid across the roadway, and were probably well greased. One of the workmen is bringing up a saw and two axes, probably to cut and split these sleepers. A little further on some more slaves are engaged in raising a mound, carrying earth and stones up in baskets. It seems probable that this mound is merely the continuation of the incline up which the sculptured block is to be dragged in order to obtain its proper elevation. Allowances being made for the somewhat crude style of art and the absence of any attempt to conform to the laws of perspective, the scene thus depicted is graphic in the extreme, and strongly reminded the lecturer of what he had witnessed amongst the marble quarries of Italy. Huge blocks are there moved in almost exactly the same way, except that, their course being for the most part down hill, the cables are used to retard and control the movement of the sledge by a couple of turns being taken round heavy timber posts firmly and deeply embedded in the rocky soil; otherwise the picture is much the same. The vast mass of stone on its wooden sledge, the great cables, the long and ponderous lever bars, and last, though not least, the gangs of toiling, anxious men, some running ahead with sleepers, others laying them in order on the track, the man on the block giving orders, and others behind picking up the sleepers to pass them forward as soon as the sledge has gone over them, whilst a number of others are hanging for dear life on the cables, or belaying one which has come to its end, whilst another is being bent around a post further ahead. Thus from post to post they progress, shouting, swearing, and working, as, he believed, men work nowhere else, and giving us, in the nineteenth century, a living picture of what the Assyrian artist saw in his own country, and so graphically recorded nearly 3,000 years ago. Sometimes, though rarely, the cables slip or part, and then the fate of a gang of quarrymen is as tragic in the Carrara mountains as it could have been in Assyria in the days of Sennacherib. The wedge, the lever or crowbar, the greased slip, and perhaps the roller, with plenty of wood packing to block up with — these are the only tools required to raise statues, or to build pyramids. Their action is certain, but very slow, and consequently, as a rule, very costly. Nevertheless, these are the appliances chiefly used in the sculptor's studios even at the present day. The sculptor, with two or three assistants only, is able to move and control works of very great weight and size. When, however, the work has to be raised to any considerable height, and its weight is not so enormous as to prohibit the use of lifting tackle, it it usually far more economical to use some from a gantry or travelling crane, to sling the statue, carry it boldly over its pedestal, and then lower it into position. This plan was chosen by M. Bouchardon for erecting the Louis XV statue in Paris, and fortunately the most exact accounts of this work have been preserved for us, such as he now had the pleasure of describing. The great statue was of bronze, made in one single casting, and measured seventeen French feet in height. Its weight — for it was on the whole a needlessly heavy casting — amounted to about twenty-five tons. The height of the pedestal seems to have been about twenty-one feet, and the statue being held in place by three irons each about four feet six inches long, which were fixed in the legs of the horse at the time of the casting in bronze, it was necessary to lift the head of the statue to an altitude of about forty-three feet from the ground, in order to drop these irons into the holes prepared for them in the pedestal. Unfortunately, a delay of five years took place, and it was not until after the conclusion of the war that the work of erection was taken in hand. In the meantime, M. Bouchardon had died, and the direction of the work was entrusted to a contractor, M. Lherbette, who placed it successfully on its pedestal on the fifth of May, 1763. The apparatus employed was practically the same as the travelling-cranes used at the present day, though its power of lateral movement was very small. It consisted of two very heavy timber frames placed parallel to each other, the distance between them being about fifteen feet. These frames each measured about forty-seven feet in height by eighty feet in length. They were strutted and stayed in every direction, save only where the space was left free for the movement of the statue. The pedestal, which measured twenty-one feet long by twelve feet wide, and twenty-one feet high, occupied one end of the space inclosed within this scaffold. The tops of these frames were furnished each with a rail on which worked the "moving scaffold," as they called it, from which was suspended the equestrian statue.

This moving scaffold consisted of a very strong timber framework which could be traversed longitudinally on the rails on the top of the fixed scaffold by means of crowbars worked into holes through the ends of the flanged rollers on which the "moving scaffold" travelled. To aid in this longitudinal traverse the "moving scaffold" was also hauled forward by two windlasses, worked with crowbars and situated on a fixed platform at the end of the lower or main scaffold. The "moving scaffold" was composed of two stories, the lower one being the framing of which I have just spoken. The upper story consisted of a second framing of very heavy timbers, for the accommodation of the pulley-blocks and windlasses used for lifting the statue vertically, and rested on heavy beams, which formed the top members of the lower framing. This upper frame, with all the windlasses and tackle, had a short lateral traverse, being placed upon iron rollers which worked upon flat iron rails, with which the upper surfaces of the lower and the lower surfaces of the upper frames were provided. The lateral movement required to enable the workmen to drop the irons of the statue vertically into the holes prepared for their reception was, of course, very small, so that the lateral movement was obtained by the simple but effectual plan of driving wedges instead of using either screw or windlass. The entire operation was successful. The statue was taken from the studio, on the seventeenth of February, 1763, and transported on a trolley of the usual type, but of enormous strength. The trolley had no floor proper, but only an open framing through which the irons of the horse's legs projected. The statue was carried in an upright position, being stayed and braced in all directions by means of a strong timber framework shaped to the varying forms of the statue, and holding it immovably fixed in its position on the trolley. The motive power was obtained not from oxen or horses, but by means of capstans, which were attached to piles driven in the ground and shifted from place to place as the work progressed. The guidance of the trolley was effected by means of a crossbar at the end of the pole. A number of holes were made in this crossbar, and a movable pin was dropped into one or other of these, as required. The end of the rope was not made fast to the pole, but to the fore-carriage, and by passing it outside the pin pressure could be brought to bear on either side of the pole at will; so that the rope itself was made to guide the carriage. This mode of progression seems extremely primitive, but Mr. Simonds saw it employed not twenty years ago in Italy, on the occasion of the transportation of a colossal statue of one of the churches in Rome. The distance being considerable, and the rate of progress naturally slow, the statue took about three days to arrive at the chosen site where the pedestal and the hoisting apparatus were already erected. The statue was then raised by means of four sets of tackle, each worked from a separate windlass fixed to the lower frame of the "moving scaffold." Each of these sets of tackle consisted of two wrought-iron blocks, each of which contained two rows of gun-metal pulleys, one of which was considerably larger in diameter than the other in order to allow the ropes to pass over each other. There were three pulleys in each row. Some of these blocks were secured to the top frame of the travelling scaffold from whence the fall was had to the windlasses, which were attached to its lower frame, whilst the other four corresponding blocks were fastened by rope-slings to the body of the horse, two being at the hind-quarters and two at the fore-quarters.

Besides this, there were two single purchases, one from the horse's neck and one from his tail. These two last were worked each from a windlass on the top frame of the travelling scaffold. Thus the balance and movement of the statue were as completely under control as they could have been with the best traveller of the present day, although, of course, the whole apparatus just described must have been rather cumbersome and inconvenient to use, if only on account of the windlasses and men required. Of the latter there must have been at least forty, if all the posts were fully manned. It would, however, have been possible to work the traveller with somewhat fewer men, as of the eight windlasses six only would be worked at the same time. However, in spite of the confusion which would be likely to ensue with so many men working together on different parts of the apparatus, the work of erection seems to have been not only successfully but rapidly completed. He had spent so much time on the description of this "moving scaffold" because it is the earliest example of a travelling crane which he had met with. It is unfortunate that we do not know how the equestrian statue of Louis XIV by Girardon was erected in 1698; but it was probable that the statue was blocked up and the pedestal built under it. Girardon's statue was twenty-one feet in height, but that of the pedestal is not recorded. Bouchardon's statue, which was erected by means of the moving scaffold, was only seventeen feet high, and the pedestal twenty-one feet. The above-mentioned statues have been destroyed, and their place knows them no more. They might well have been replaced, as was the statue of Henry IV, on the Pont Neuf, in the early part of the present century, and concerning the construction and erection of which we are possessed of very ample details. As the method of erection differed in many respects from that employed for Bouchardon's statue of Louis XV, and as it seemed to be very ingenious, he thought it was quite worth describing. This statue, which is doubtless known to most visitors to Paris, is about the same size as the before-mentioned statue of Louis XV — that is to say, about twice life size. He did not know its exact height, but it is probably about seventeen feet, which was the measurement of the original statue of Henri IV, by Pietro Tacca, destroyed in 1792 by the vandalism of the people. The present statue by Lemot, erected in 1818, was intended to be as nearly as possible a reproduction of the older memorial, and therefore there is every probability that its dimensions are the same, or nearly so. Its weight is given at about twelve and one-half tons, being, therefore, a very much lighter casting than the Louis XV. The contractor, M. Guillaume, offered to erect the statue on its pedestal at his own expense. It is, therefore, reasonable to suppose that he adopted what was, in his opinion, the most economical method. The statue was not conveyed on a trolley by

means of shifting capstans, but was put on a sledge, fixed in position and firmly braced with heavy timbering, and then dragged along over rough and smooth by eighteen yoke of oxen. The progress made was very slow, the roads being bad, and the next day the oxen were replaced by sixty horses, but part of the road being on a rising gradient, these were found insufficient, and ten more had to be added.

The sledge, however, was at last brought up to the pedestal, and the horses were dispensed with, and the ponderous sledge brought into its proper position by means of timber jacks and levers. Then a scaffold about fifty feet high, moving on rollers over a wood packing, was brought over the sledge, and the statue was hitched on to a purchase of two blocks with six pulleys in each, by means of rope slings fastened, not to the statue itself, but to the woodwork which formed the upper portion of the sledge, and was, in fact, a sort of cradle on which the belley of the horse rested. The scaffold consisted of a pair of shear-legs about fifteen meters in height on each side. Their lower ends were secured to the outer member of a heavy base frame, consisting of two horizontal timbers, placed at some distance apart, but joined firmly together by six cross beams notched in on the upper surface of the longitudinals. These frames formed the base for each pair of shears, and were placed on wooden rollers, of which there were four under each pair of shears. The upper ends of each pair of legs were connected with the corresponding legs of the opposite pair by being mortised into a cross timber three meters in length, in such a manner that about one meter projected on either side, whilst a nearly equal distance separated the two legs. These cross timbers were lashed together with ropes, which also served to secure the upper block of the tackle, of which he had already spoken, the whole forming a gantry moving on rollers. Besides these principal timbers just described, which were further braced by horizontal cross pieces at such a height as not to prevent a free traverse over the pedestal, there were others rising vertically from the inner longitudinal timbers of the base frames already described. These timbers were about six and one-half meters in height and were sixteen in number, being placed in clusters of four near either end of each base frame. They were joined at the top by two horizontal timbers running side by side, and parallel to the longitudinal timbers of the base, each of these timbers receiving the heading of four of the uprights, and connecting them rigidly to the inclined legs of the gantry. The uprights were placed at a sufficient distance from each other to permit a long and powerful lever to be worked between each group of four. There were four of these levers, each measuring five meters in length, and shaped very much like those which are used in platelaying on the railroads; they were so placed that each lever had two upright timbers on either side, which acted as bearers or checks. Furthermore, the uprights were pierced with holes at regular distances for the reception of heavy iron pins, to serve as fulcrums for the levers. As, however, each pair of uprights was furnished with a pin, and the lever worked through two pairs, it was only necessary to arrange the holes so that those on the one pair were not on the same level with those in the other, but occurred intermediately, to enable the operator to shift at will the fulcrum of his lever to a higher level. These levers were so arranged as to be worked by means of a block tackle to each lever by four gangs of men acting simultaneously. This apparatus was worked forwards on its rollers on either side of the pedestal until it stood over the sledge, when the tackle having been hooked into the slings, as described, the rollers were skidded and the ropes hauled taut. The sledge and framing below the cradle, on which the belley of the horse rested, was then taken to pieces and removed, and the levers placed in position to act on the timbers of the cradle on either side. Forty workmen divided into six gangs, each under the orders of a foreman, were employed on the work, there being one gang of men to each lever and to each capstan. The levers were found to act perfectly, each stroke raising the statue about nine inches, so that in a very short time the desired level was reached.

It was found that the men with the levers were able to raise the figure so rapidly that the two capstans were unable to keep pace, and they could not keep a proper tension on the ropes. As soon as the height was attained the ropes from the tackle were belayed by means of whips taken from the base frames on either side. This, of course, would prevent the statue from lowering, and therefore the levers, which till that time had sustained it, were unshipped, and the statue remained suspended, but in front of the pedestal, not vertically over it. In order to bring it into this latter position, a second pair of whips were taken from the base frames and belayed to the ropes in the direction of the capstans. The skids were then knocked out, and by means of the same ropes and capstans the scaffold was brought into its proper position. It was found, however, that a lateral movement of about half an inch was required in order to bring the irons vertically over the holes prepared for them. As this lateral movement had not been provided for, it was found necessary to shift the scaffold on its rollers with the aid of timber-jacks and levers, an operation which was, we are told, quickly and easily accomplished. This may have been so; but he confessed that it seemed to be rather a blot on an otherwise very neat arrangement, and the more so that it might so very easily have been avoided by the exercise of the very simple precaution of keeping a couple of plumb lines to sight by during the traverse of the apparatus. At the present day all the appliances for moving heavy weights have been brought to such perfection that where these are of regular form, and not liable to injury, it is a very easy matter to handle even the heaviest. But with sculpture there are often unusual difficulties to contend with, on account not only of the awkward shape of a statue, but also on account of its very great liability to injury. Even when the material is bronze the greatest care must be experienced to avoid undue pressure on any one spot, as the statue, though not very liable to be broken, is very likely to be disturbed or indented. If it is possible without great inconvenience to sling the statue and erect with a travelling crane of sufficient size and power, it is of all the easiest and simplest plan. Such a crane is, however, frequently unavailable, in which case the simplest plan will be to place two beams of sufficient length one on either side of the pedestal. These beams must be long enough to project somewhat beyond the pedestal at the one end, and the statue standing on the ground before it at the other. The statue is to be slung in a cradle in such a manner as to leave its base free. The ends of this cradle are to rest on either side on the two beams. These beams are then to be raised to the required level by the simple process of jerking up and packing under. If the packing is of convenient size and properly squared so as to lie true, this method is both rapid and safe; care being taken, however, to strut the packing and also to cramp it together, whenever the height becomes so considerable as to render it desirable. The two beams, together with the cradle and statue, having arrived at the required height, the cradle is to be shifted forward on the beams until it is in its exact position above the pedestal. This can be effected either by means of travelling-jacks or by the old method of employing either slips or rollers under the cradle, and drawing it forward by means of tackle from the ends of the top beams. If this latter method is adopted, four very ordinary screw-jacks are all that are required. These can, however, also be used to traverse the cradle, by removing two of them from beneath the beams, and bolting a heavy chock on each of the top beams to give a bearing to the foot of the jacks; they can then be effectively used in a horizontal position to traverse the statue any required distance, by the intermediation of wood packing. The exact position over the pedestal having been reached, the jacks are to be again placed under the top beams, and the beams and cradle lowered until the base of the statue rests on the pedestal, when the cradle can be taken to pieces and the beams and packing removed. This method all will readily perceive is identically the same as that practised by the Americans for lifting and moving buildings, and for which they justly take no little credit. The credit is due, however, not for their discovery of the method, which has been practised by sculptors ever since screws have been invented or statues erected, but for their cleverness in seeing that the same appliances that would move a statue, raise it, and put it on its base, could also do the same for a stone or brick building. The only innovation in their practice is the introduction of the right and left-hand screw for travelling purposes. This has never been used by sculptors, nor, indeed, is ever likely to be, as they, from motives of economy, never get more plant than they can help; and the favorite tool in most studios is still the old-fashioned timber-jack, with its rack and pinions, and its honest wooden case. The system of blocking up is excellent when the total lift does not exceed ten or fifteen feet; but for anything beyond this it will probably be found more convenient and quicker to construct a scaffold or framing of timber and carry up inside it a rising platform by means of jacks and packing, but replacing the latter at regular stages with upright struts, properly cramped to the timbering of the scaffold. This is, however, a far simpler, better, and cheaper plan, but one which is seldom adopted because of the insane impatience which possesses the public at the present day to see what looks like progress. It is very unfortunate that the importunity of his employers often forces an artist to use undue haste both in the construction and in the erection of colossal works. If he permits himself to be influenced by this desire for haste in the production of his works, his reputation as an artist is likely to suffer in the end.

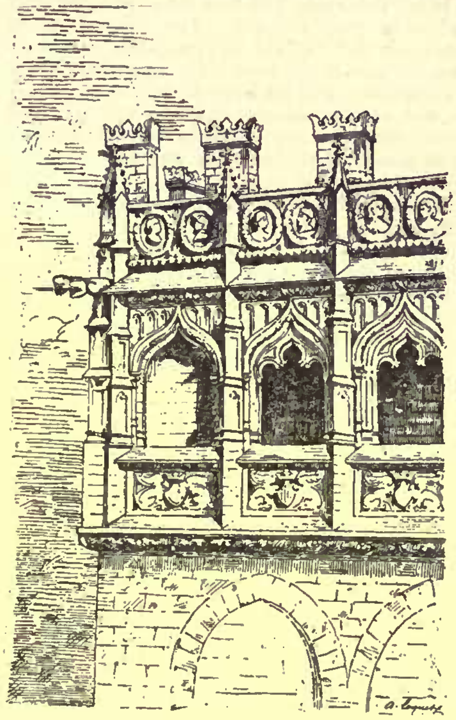
If he is wise he will yield only in so far as the work of erection is concerned, by saving a small amount of time at the cost of increased risk and expense to himself. This was the lecturer's case, and in order to show progress and to bring the date of inauguration as near as possible, he had to erect a statue weighing about sixteen tons by one of the methods already described, instead of making use of the more economical and practical plan. The statue in question is a lion measuring thirteen feet odd from the plinth to the top of the mane, and eighteen feet from the fore paw to the hind paw. He is in a defiant attitude, and walking forward, the motion, however, being arrested, and all four feet taking a bearing on the ground. The pedestal is, roughly speaking, about twenty-four feet long by eight feet wide and thirteen feet high. The plinth of the lion measures one foot in height. As pedestals of this size are not monoliths, but are usually built up either of brick or stone, and cased outside with their proper architectural members, in any desired material, there is no reason why the pedestal should be erected before the statue, and had not time been an object with me, I should, Mr. Simonds proceeded, have erected my lion on the following plan: During the construction of the lion I should have had the proper foundations put in, and the casing, in this case of terra-cotta, got ready for erection, but I should have done nothing more until the statue was finished and conveyed to the spot. I should then have placed it exactly in position on the already-prepared foundation. This statue, like most colossal statues of quadrupeds, has no proper plinth. He rests on his four feet, supported by four massive brick piers, constructed in the interior of the pedestal, which is hollow. The entire weight of the statue

coming on these piers, the outer walls, which are considerably battered on the inside, have nothing beyond their own weight to support, except the terra-cotta plaques which form the casing, and which are built into the walls by means of projecting webs on their inner surface, and a portion of the weight of the false plinth, which is very insignificant. Had I unlimited time at my command, I should have placed a timber cradle under the belly of my lion, and have raised him by means of jacks as the work of erecting the pedestal progressed, alternately raising the piers to the level of his feet, and blocking up under the jacks. When the work of erection had been completed, I should have removed the jacks and packing, and have finally closed in the top of the plinth. As, however, the erection of the pedestal was a work of several months, owing to the exigencies of the terra-cotta work, I was obliged to abandon this plan, and the pedestal is already erected, whereas the statue is still in the hands of Messrs. Young, the founders. Where hydraulic jacks, travelling cranes, and an ample supply of timber are obtainable, there is, I think, no difficulty in the erection of colossal statues of almost any size. The trouble in these cases lies rather in the construction of the statue than in its erection, and the construction becomes an engineering quite as much as an artistic problem. In the construction of the lion of which I have just spoken I adopted the plan of working from a carefully-prepared model of life size. A duplicate cast of this model was obtained, which was divided into eleven pieces — namely, four legs, one tail, one hindquarters, one middle piece, one forequarters, one head, one lower jaw and tongue, and one man-hole cover in the back.

These pieces were all fitted to each other by means of key pieces, to avoid any possible error. They were all enlarged separately, the necessary measurements being obtained by the aid of the "iconograph," which I had the honor to describe to you on a former occasion. As the description of the enlargement of one part will do for all, I will briefly describe the manner in which the body was constructed, and the precautions taken to insure a perfect fit between the parts. The body consisted of three parts — namely, the hindquarters, the middle piece, and the forequarters. The pieces in the small model were divided by straight transverse joints, fitted to each other with keys. The forequarters were the first piece constructed. The small model was set up on end, the vertical section, or joint, thus becoming horizontal, and serving as a base. Beneath this base was arranged a plaster seat or chuck, which, being cast, naturally took exactly the imprint of the keys, besides showing perfectly on its upper surface the true section of the body. The model was then removed, leaving the chuck properly centered on the reducing table of the iconograph. A precisely accurate copy of this chuck was then made in plaster on the enlarging table, the keys, however, in this instance, being made of gun-metal, accurately fitted in pairs, one of each pair being embedded by its shank in the plaster of the chuck. It is obvious that any two objects of whatever varying form that might be constructed on this chuck must have the same base section, and the same arrangement of keys; these latter, however, being male and female, must be reversed. The method of reversing I need not enter into, as being too simple a matter to need your attention. It will suffice to say that the accuracy of the joints is absolutely dependent on the chucks. On these chucks the iron framings of the models were erected, and the models themselves constructed in plaster. This method was adopted with all the pieces, and with perfect success, the joints and keys coming together with great accuracy. The lion was then erected in my own studio, being suspended by means of chains from a scaffold erected for that purpose. It was then taken down again, and piece by piece delivered to Messrs Young and Company's foundry. The middle piece of the body was, however, permanently cramped on to the forequarters to be cast with it in one piece. The construction of colossal statues is quite as much an engineering problem as their erection, though the latter has received more attention from engineers, and, indeed, from the public. This is natural, as the process of construction is carried on very quietly in the seclusion of the studio, whereas the work of erection is usually conducted in the open air, and under the public eye. In the former, the work goes slowly, sometimes almost imperceptibly, and is often not very intelligible, save to the initiated. It includes a variety of processes not unfrequently spread over a number of years: whilst the progress is rapid and the result striking when the work is that of erection, so that the latter is apt to be remembered, whilst the former remains unknown or is forgotten.

Not a New Discovery.— The origin of natural gas is not so recent as many imagine. In the diary of an old gentleman named Wickersham it is related that in 1831, when Barcelona, on Lake Erie, in this country, was a port of considerable importance, the lighthouse lamps at that place were fed with natural gas taken from a spring three-quarters of a mile away. This spring was in a marshy place, several acres in extent, and the water overspreading it was constantly bubbling with gas. When these bubbles broke into the atmosphere they would flash if a light was held near. A tower twenty feet across was built over the spot where the bubbles broke in greatest number, and from this rude reservoir or gasometer the gas was conveyed in wooden pipes to the lighthouse, which was fifty feet in height. Enough gas was collected during the day to supply the burner of the lighthouse during the night. From wells since drilled Westfield is supplied with gas sufficient for illuminating purposes, but not in quantity adequate for fuel.—*Exchange.*

CONCRETE FLOORS.



La Longa at Valencia, Spain.
(Rep. Gen. Soc. Arch'ts. Paris.)

Referring to the lecture on "Concrete" reported in a recent issue, Frank Caws offers to the *Builder* the following facts and formulæ for the guidance of fellow-architects and others seeking definite information on this important subject.

The "Phœnix Warehouse" (Messrs. Pearman & Corder's) of Sunderland, Eng., erected from my designs about six years ago, is a fire-proof structure, with concrete floors throughout. There are 1,800 tons of cement concrete in the floors of this building. It was only after long and patient study and research I satisfied myself that my clients' interests would not be jeopardized, but that, on the contrary, a very considerable saving of cost would be effected by the daring expedient of trusting concrete slabs (the largest of which are no less than 21 feet by 12 feet 6 inches) of average 13 inches thickness, to sustain the great loads and rudely impactive forces of the wholesale provision trade.

Of course, I was very careful as to the quality of cement (all of which was manufactured by Messrs. Grimshaw at North Hylton, near Sunderland), and which ranged in tensional strength from 700 pounds up to 1,000 pounds per square inch. I also endeavored to secure that all the cement should be not less than one month old, because the cement, which is hot from the heap, cannot be relied on to retain its first strength.

I had the cement mixed one to four with good hard-broken brick aggregate.

The result is that, after six years' practical test, these floors stand quite unshaken, and even those few of the slabs which, before they were used, cracked right across from contraction in drying, stand the heavy work, and show no indication of weakness.

There is a 12-horse power Otto gas-engine working on the top-floor, about 35 feet above the ground, and the vibration is barely perceptible.

Two or three serious fires have occurred in this warehouse since it was opened, but, beyond damage to stock and fixtures, no harm was, or very well could be done.

Those iron girders which are used to sustain the outer edges of the large slabs above referred to, are thoroughly embedded on all sides, except the soffit of the bottom-flange, which is flush with the concrete ceiling.

It is important to observe that, by embedding the girders thus, not only are they protected from fire, but also the concrete slabs have their edges *encastré*, which condition adds enormously to their stiffness and strength.

The greatest stress on an *encastré* slab of any material may be found as follows: —

L = Length of slab, in inches.
B = Breadth " "
D = Depth " "
ω = lb. weight per inch of slab surface-area, uniformly distributed.

f = The greatest tension per inch of sectionl area of slab.

$$f = 0.5 \times \frac{L^4}{L^4 + B^4} \times \frac{B^2}{D^2} \times \omega$$

What is required for cement concrete slabs is not a formula to represent the maximum stress, but a constant to render such formula applicable to practice.

In the case of the "Phœnix Warehouse" the maximum load per square foot of floor is about 2 hundred weight imposed and 1 hundred weight of concrete itself = 3 hundred weight per foot, or 2.3 pounds per inch of surface-area. And all the items of the formula stand as follows: —

L = 252 inches.
B = 150 "
D = 13 "
ω = 2.3 lbs.

Therefore,

$$\int = 0.5 \times \frac{254_4}{252^4 + 150^4} \times \frac{150^2}{13^2} \times 2.3$$

$$\int = 136 \text{ pounds.}$$

Hence, it is proved that 136 pounds per inch is a safe maximum stress for cement concrete-mixed four to one, as before described.

I may say that some of the slabs were loaded when they were about one month old.

I believe that much larger maximum stress would be safe than that of the Phœnix Warehouse, but I would not venture on much larger slabs of that thickness and quality without wider experience to justify me.

I would, therefore, myself use the before-named formula in further practice, and take 136 pounds per inch as the safe stress for all slabs formed four to one of cement of not less than 700 pounds' strength.

If one could be sure that cement-concrete slabs would not be greatly loaded for the first three months after setting, an allowance could be made for the enormous gain of strength which occurs during that period.

During the first twelve months after setting, cement-concrete is known to gain five or six times the strength it possessed at the end of the first month after setting, and the bulk of this gain occurs in the first few months of the twelve.

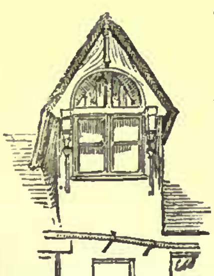
But, as the urgency of trade can seldom allow a clear three months for setting of concrete floors, it is safe only to calculate on a tensional strength which has proved itself safe under such practical conditions as the "Phœnix Buildings" present.

As regards the great density of concrete floors tending to overload the foundations of a building, I do not think that is to be feared where the concrete is not stupidly thick, and where the foundations are reasonably good. For the equal distribution of load can be fairly maintained; and that is practically of more consequence than the mean intensity of the load. But where parts of the flooring are sustained by metal columns or detached piers, special care should be exercised to give a great spread to the footings of such detached supports.

In cases, however, where, either from insecurity of foundation, or instability of walls, or from other and special reasons, an exceptionally light, and yet strong fire-proof floor is needed, hollow terra-cotta blocks, filled with "lime riddlings" or other light suitable material, and fitted together, as shown by Messrs. Doulton at the Inventions Exhibition last Summer, are worthy of consideration.

But for ordinary cases, cement-concrete, as applied to the "Phœnix Warehouse," is, I am satisfied, the cheapest and best form of fire-proof flooring.

PILE-DRIVING.



Old Dormer Window Caen, France.

REFERRING to the question often asked, "What is the force of a blow?" the London *Engineer* says: —

We shall assume that the blow with which we have to deal is caused by gravity, and that it is due to the arrest of a falling weight, such, for example, as the monkey of a pile-driver. It is clear that if the monkey were employed to raise 1 ton through a height of 4 feet, it must exert a force or push of 1 ton throughout the distance 4 feet. If it did not it would not move 1 ton at all, for it would be overbalanced. If it were called upon to raise 4 tons through a height of 1 foot, then it must exert a push of 4 tons through a distance of 1 foot. If to lift a weight of 48 tons 1 inch, then it must exert a push of 48 tons through a distance of 1 inch, and so on. Bearing this in mind, there will be no difficulty in understanding the following simple rule: The force of a blow is measured by dividing the whole distance x passed through by the monkey before impact by the distance y passed through after impact, and multiplying the weight by the quotient. Thus, let the monkey weigh 1 ton, let the fall x be 48 inches, let the pile descend 1 inch $= y$ at each blow, then the force of the blow — or, in other words, the push or effort exerted by the monkey on the top of the pile — will be $\frac{48}{1} = 48$, and $48 \times 1 = 48$ tons. If the fall was 20 feet, or 240 inches, then the effort would be 240 tons, and so on. It must be understood that this is the mean or average force of the blow. Its initial effort may be much greater and its terminal effort may be much less, because at the instant of impact the monkey is moving at its full velocity, while at the moment when the pile ceases to descend it will have no motion at all, and consequently will exert no push except that due to its weight. With this aspect of the question, however, the student need not now concern himself. It will be seen that the force can be varied by altering either the distance passed through before or after impact. For example, the monkey weighing 1 ton and falling 48 inches, let the pile descend only $\frac{1}{8}$ inch, then $48 \times 8 \times 1 = 384$ tons, and this leads to an important deduction. If y becomes infinitely small the force of impact will become infinitely great. We are led thus to the ancient problem, if an irresistible force encounters an insurmountable obstacle, what will happen? No such condition can by any possibility occur in practice. Some movement must take place after impact.

If our readers have followed what we have said, they will see that to ask how to calculate the force of blow, given only the weight and the fall, is to put an absurd question. Three factors are in all cases necessary, namely, the weight, the height of fall and the distance through which the body which receives the blow moves. In practice it is by no means easy to ascertain the latter with precision, and the energy in the falling body can be expended in more ways than one. For example, when the head of a pile is struck, two effects take place simultaneously — the monkey is shortened and so is the pile. The elastic rebound of each immediately takes place, and the monkey jumps up from the top of the pile. Again, the top of the pile becomes highly heated. In very dry weather the top of a pile has been known to take fire under the blows of a light monkey rapidly repeated. The elasticity of the pile plays an important part in influencing the rate of its descent. A monkey weighing 100 pounds, falling a height of 50 feet, will have stored in it on impact $50 \times 100 = 5{,}000$ foot-pounds, and if the progress of the pile were 1 inch its driving force would be $600 \times 100 = 60{,}000$ pounds. A monkey weighing 1,000 pounds, and falling 5 feet, would also have 5,000 foot-pounds of work in it, and would exert a driving force of 60,000 pounds over a space of one inch; but it does not follow that the former would be easily effective in driving the pile. On the contrary, the lighter monkey striking the pile with a higher velocity might be much less efficient of the two, because the force of the blow would not be transmitted through the pile, but would be expended in compressing the top of it, probably in shattering the wood. We do not propose to go here into any questions concerning modulus of elasticity, which would only serve to complicate a statement which we desire to keep so simple that it may be understood by those who only possess the most elementary mathematical knowledge; but this article would, on the other hand, be manifestly incomplete if we did not say something further concerning the respective values of light and heavy monkeys and hammers, and high and low falls.

When a pile is struck on the top, what is known as a "wave of compression" passes through it, and this wave requires time for its passage. Such a weight is set up in all columns when stress is suddenly brought on one end. Thus, for example, if the muzzle of a fowling piece containing a column of air is plugged up with a cork, or with snow or mud, the barrel may be burst when the weapon is fired, simply because, while the pressure at the muzzle is yet too small to move the cork, the pressure at the breach end is great enough to burst the barrel. The wave of compression will not reach the muzzle till the breach has been burst. In the same way the detonation of a lump of dynamite on a rail will break it, the action being so sudden that the wave of transmission of pressure has not time to pass through the air surrounding the dynamite, and the air really plays almost the same part as a clock of steel round the explosive. The effect of a heavy ram falling a short distance on a pile-head resembles a push in a sense, and gives time for the transmission of the effort throughout the whole pile; but when a light monkey falls the effect may be confined to the top of the pile, which is shattered. In order to make this quite clear we must take into account the element time, concerning which we have said nothing yet.

The velocity with which a monkey strikes a ram is calculated by extracting the square root of the height of fall in feet, and multiplying it by 8. Thus, let the monkey fall 4 feet; the square root of 4 is 2, and $2 \times 8 = 16$ feet per second. If the monkey fall as stated in our last example — 50 feet — then we have 7 as the nearest whole number square root, and $7 \times 8 = 56$ feet per second as the velocity with which the monkey would strike the pile. If this speed was greater than that at which the wave of transmission could pass through the pile, then little or no effect would be produced in the way of causing its descent; nearly the whole of the work would be done in compressing the top of the pile or in shattering it, and the driving effect would be *nil*.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

VERMIN IN HARD PINE.

DETROIT, MICH., May 4th, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you kindly give us what information you can in regard to the presence of vermin in Southern pine as stated in your last editorial. We are now planning to use it for beams in a very extensive seed warehouse, and such information as you could give in this regard would be acceptable. Respectfully, M.

[The Southern pine seems to be the natural habitation in this country of the *cimex lectularius*, or bed-bug, which is found in immense numbers under the bark of old trees of that species. If the wood contains natural clefts the insects and their eggs remain in these after sawing, and are often carried in that way in the seams of large timbers into buildings. It is worth noticing that living trees of yellow pine sometimes keeps houses near them infested with the vermin, which stray in all directions from their home.— EDS. AMERICAN ARCHITECT.]

THE BOSTON SCHEDULE OF WAGES.

Boston, 1886.

To the Editors of the American Architect: —

Dear Sirs,— The annexed statement of the terms agreed to by the Master Masons of the Mechanics' Exchange should be largely qualified by the fact that many master masons of the said Exchange refuse to be bound by the action of the said committee, but follow entirely the views and action of the Master Builders Association.

The Master Builders Association, by unanimous vote of *builders of all classes* decline to make agreements or arrangements with the workmen *through any of the unions or societies*, but take decided stand for *ten hours, and eight hours on Saturdays*, and individual contractors of this association will only meet their individual workmen and set them at work at the standard above mentioned.

William H. Sayward, *Secretary, M. B. A.*

Following is the standard for pay and working hours agreed to by the committees representing the master masons of the Mechanics' Exchange and the Boston Bricklayers' Assembly, No. 5787, Knights of Labor:—

1. That nine hours per day be the standard time to constitute one day's labor.
2. That employés shall be paid on or before five o'clock P. M. on Saturday.
3. That this rule shall go into effect on May 1, 1886, and to remain in force until May 1, 1887.
4. That three (3) months' notice shall be given of any intended change in these resolutions.
5. That the present rate of wages be the standard.
6. That members of the Boston Bricklayers' Assembly have the preference in all cases.
7. That these resolutions shall be binding on all master masons, whether builders or jobbers, within the jurisdiction of the Boston Bricklayers' Assembly of the Knights of Labor.
8. That in all cases the firm be its own judge of the competency of the men in its employ.
9. That pending the discussion of any dispute there shall be no lockout, strike, stoppage or cessation of work or business on the part of employers or employés conforming to this agreement.
10. That the hours of labor shall be from 7 A. M. to 5 P. M.

[Signed. Walter S. Sampson (Chairman), Marshall N. Stearns, Peter E. Donahue, George D. B. Small, William B. Hewett, for the master masons; and Horace L. Worcester (Chairman), Maurice Fitzgerald, William T. Loring, Jeremiah Harrington, Michael J. Carroll, for Bricklayers' Assembly, No. 5787. E. R. Welch, Clerk of Committees.]

NOTES AND CLIPPINGS

A Thirteenth-Century Chapter-House unearthed at Dublin.— It has just become publicly known that a missing chapter-house which was buried at the great fire in Dublin in the thirteenth century has been discovered by some workmen who were excavating underneath Christ Church Cathedral. In the chapter-house were beautifully-carved effigies, coins, tiles, and marvelous specimens of architecture. The discovery has created quite a sensation. The lord-mayor, the clergy, and prominent officials and citizens have inspected the excavated articles.

Theatre Fire Statistics.— The general absence of proper precautions against fire in theatres is strikingly exhibited by the exhaustive returns on the subject compiled by the French Statistical Society. The statement includes the whole civilized world, and covers a period of 135 years. During that time 632 theatres have been destroyed by fire, and the number of the victims is 6,573, or an average of 48 a year, which, when the vast number of play-goers is taken into account, does not seem a very enormous sacrificial tribute to the god of pleasure. But the average does not represent the true state of the case, for the sum total of lives annually lost has progressed uniformly (with the exception of the year 1845, when 1,670 perished with the theatre at Canton) till it reached as high as 1,217 for the decade 1870–80. Moreover, of the 632 theatres, no fewer than 174 have been burned down in the last five years. It is true, of course, that the number of theatres, and of those who attend them, has of late years tremendously increased, and so to a certain extent has the care which provides against fire and loss of life, but the latter bears no sort of proportion to the former, whereas it should be at least equivalent.

Mr. Ruskin on Water-color.— Mr. Ruskin, in a recent letter to the London *Times*, says: " There is no china-painting, no glass-painting, no tempera, no fresco, no oil, wax, varnish, or twenty-chimney power extract of everything painting which can compare with the quiet and tender virtue of water-color in its proper use and place. There is nothing that obeys the artist's hand so exquisitely; nothing that records the subtlest pleasures of sight so perfectly. All the splendors of the prism and the jewel are vulgar and few compared to the subdued blending of infinite opalescence in finely-inlaid water-color; and the repose of light obtainable by its transparent tints, and absolutely right forms to be rendered by practised use of its opaque ones, are beyond rivalship, even by the most skilful methods in other media. Properly taken care of — as a well-educated man takes care, also, of his books and furniture — a water-color drawing is safe for centuries; out of direct sunlight, it will show no failing on your room wall till you need it no more; and even though, in the ordinary sense of property, it may seem less valuable to your heir, is it for your heir that you buy your horses or lay out your garden? We may wisely spend our money for true pleasures that will last our time, or last even a very little part of it; and the highest price of a drawing which contains in it the continuous delight of years cannot be thought extravagant as compared to that we are willing to give for a melody that expires in an hour."

M. Gerome on the American Art Tariff.— In regard to the American tariff on paintings of foreign artists, Gérome said lately to a correspondent of the *New York Tribune*: —

" It will not interfere with the treatment of American artists exhibiting in the Salon. They will be treated just as their works merit. French artists take a personal interest in a great many American artists. I have brought out a number of them myself and want them to succeed. There are several Americans — too many of them to recall — who have much talent. The tariff is foolish, but 't is useless to say more about it. 'T will not interfere with the sale of pictures, however, for they are luxuries bought by the rich only, and if a rich American wants a picture he will buy it even if it does have to pay thirty per cent tariff. The tariff may hurt bad artists, but it will not injure good ones. If 't would drive out of art a few hundred students it would be a benefit, for there are too many art students in the field now who will never be able to make a living. Some of them must abandon art or starve, and the sooner they do the one or the other it will be the better for art. 'T is bad policy, however, for America to tax art, since she ought to encourage artists at home, and as artists must be where they find good art, if the tax keeps such out of America it hurts American art only and not foreign, for then the American student must come here to study fine pictures. After he gets here he stays. There are many good American artists, but they live in Europe and they will find it necessary to live there until America secures good works at home."

TRADE SURVEYS

The end of labor agitations on a large scale is near. The labor leaders themselves recognize the mistakes that have been and are being made. The secret circulars, the open addresses, the published articles, and all the expressions of views and opinions show that the country has had nearly all the violent agitation it needs. An era of comparative peace is at hand. The labor conventions next week at Philadelphia and one week later at Cleveland, Ohio, will help to put an end to the fever of strikes and boycotts and extreme and unjust demands. Elements of discord are at work. Trades unionism is alarmed for its existence. The secret associations of labor are quaking with the weight of incongruous material, employing interests are organizing, and investments, while abundant, are made more cautiously. The anarchists of the Northwest have alarmed intelligent Americans and the country has arrayed itself against them. Congress will seek in vain to legislate preventive barricades against strikes. Absolute peace is not desired, and not possible in a rapidly-filling-up country of diverse conditions, where wealth is being tossed from hand to hand in the race of progress. In spite of all the industrial disturbances trade prospects are fair. Architects in several cities have completed their drawings and builders are entering on their preliminary work in a great number of enterprises. Labor disputes in the building trades are practically settled. Work is being actively prosecuted in nearly all cities and large towns. An equalization of cost is being effected. The wage-workers will, in the end, be very little if any better off financially. In several manufacturing towns in the New England States building operations were begun May 3d, and next week operations will be extended. Cotton and woolen mill capacity is being increased, chiefly by the addition of machinery and engines, but not a little additional floor space is being built especially in this State. In New York, real-estate brokers report an improving market. Architects complain of delay in the undertaking of important work. During the first four months conveyances in that city footed up 5,129 against 3,996 for the first four months of 1885, and 4,494 for the same time 1883. The corresponding values were $98,026,834, $65,000,000, and $74,000 000. These figures speak volumes. Nearly all the business in and about t. e metropolis is for investment and not speculation. During the past four months 1,536 buildings were erected at a cost of nearly twenty-five million dollars, against 1,119 buildings last year costing sixteen million dollars. The same improvement is exhibited in Philadelphia as regards conveyances and permits and investments. The only complaint made by the architects and builders there is in the delay consequent upon the industrial disturbances. The delayed work will, in all probability, be taken up. Houses are wanted. Small houses sell or rent as fast as built, and sell better than they rent. In Pittsburgh disputings continue this week in some branches of the building trades because of the extreme demands made. Much work is projected in mill, shop and house building, to say nothing of the enterprise displayed in piping natural gas from wells to points of consumption. More money is being put into reproduction channels in that city and Western Pennsylvania than for many years. Such cities as Wheeling, Youngstown, Cleveland and Toledo are aroused with industrial and building activity despite the labor agitations. Architects and builders in those places say the summer probabilities are quite favorable. Chicago has been hurt more than any city by labor agitations, but even there an abundance of work is awaiting an opportunity. In the farther West and Northwest enterprise has been let loose in railway building, and in the expansion of small manufacturing industries growing out of railway construction. St. Louis has been seriously crippled, commercially, and two or three of her leading architects say that building enterprise has been checked. Yet the demands for additional house and shop room are urgent there and throughout that State. A great deal of railway construction will be undertaken in midsummer. The rail-makers will meet shortly and probably agree to an increased allowance of 200,000 tons. The high price of rails and bridge iron has imparted some activity to importers of mill products, and an order for 1,700 tons of bridge iron were placed a few days ago in Europe for delivering of material in Cleveland, Ohio. The productive capacity of the blast furnaces has been increased 13,000 tons since January 1. This year's production will probably exceed that of any former year. The decrease in the production of steel rails were four per cent; nails, twelve per cent; rolled iron, seven per cent. But since the opening of the year iron and steel making capacity has been increased, and imports have been steadily falling off. The pig-iron production, in net tons, was, for 1885, 4,529,869 tons; for 1884, 4,589,613 tons. At present there are five hundred and ninety-one blast furnaces reported. Improvements have crowded out eighty-five. The probable consumption of pig-iron was 4,348,844 tons. The production of steel rails was 1,094,215 tons against 1,144,851 tons in 1884. There are twenty-eight completed Bessemer Steel Works and eight in process of building. The iron trade is in a vigorous condition.

The American Architect and Building News. May 15, 1886. No. 542.

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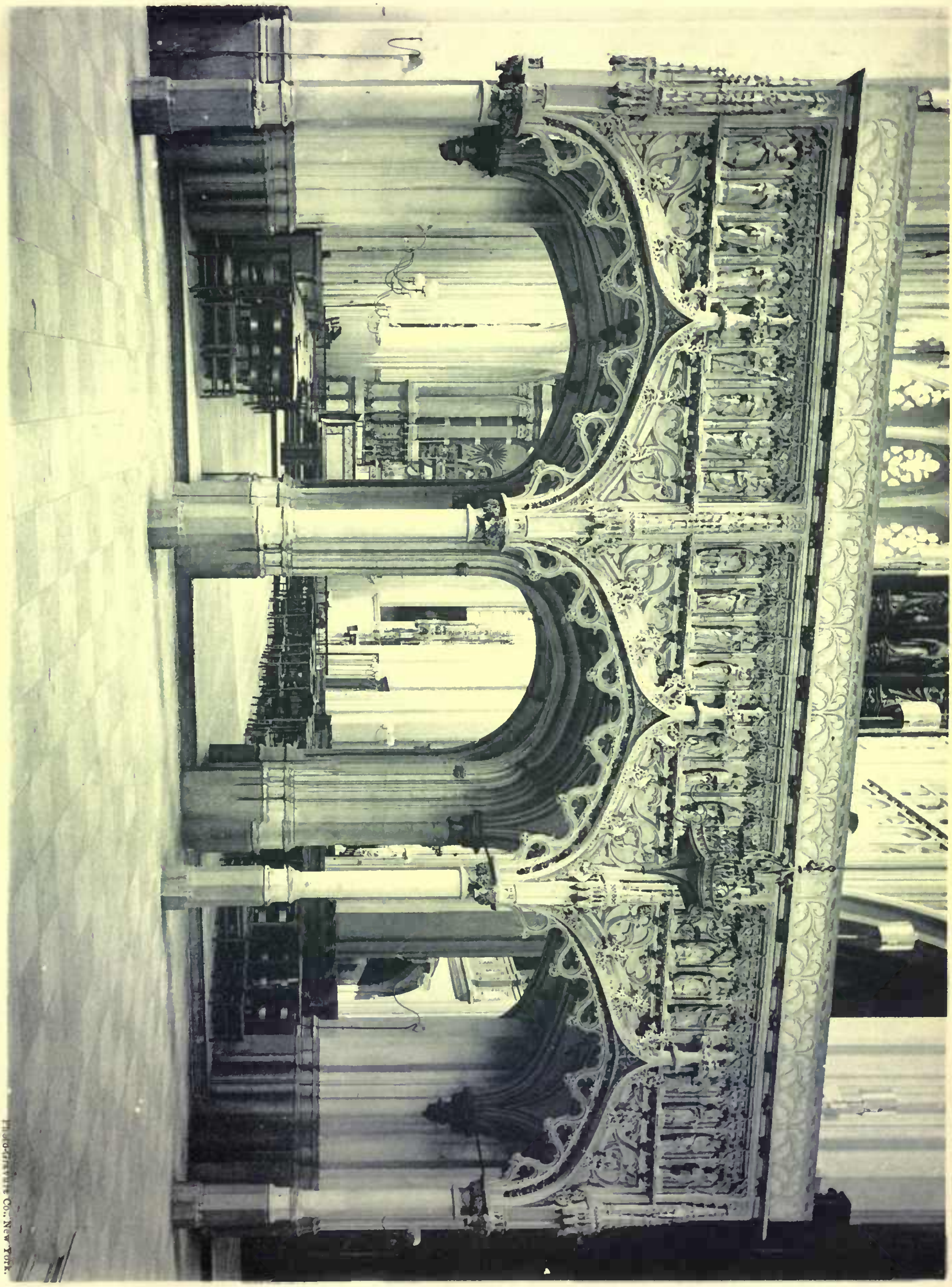


Photo-Gravure Co., New York.

ROOD-SCREEN IN ST. PETER'S, LOUVAIN.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 543.

MAY 22, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

THE troubles in the labor market, so far as the building trades are concerned, seem to show signs of coming to a speedy conclusion. The eight-hour movement, in particular, which has long been the pet scheme of the foreign revolutionists who lead American mechanics about by the nose, is in a bad way, and would have been buried long ago if it were not for the fear of their vengeance which the professed friends of the working-man have succeeded in inspiring into their followers. Few persons realize the extent to which terror is used to control the movements of the unfortunate members of the trade associations. To most of our readers the threat that their fellows in their profession would combine to prevent them from obtaining employment would seem ridiculous, not so much from the improbability that such a threat could be carried out, as from the certainty that no such attempt would be countenanced by respectable men; but to the workingman a menace of this sort has a dreadful significance. Some years ago we had occasion to have a long job of trimming done about the stonework of a new building. It was work that could best be done by the day, and, not wishing to pay a contractor's profit, it occurred to us to hunt up a journeyman who had been employed on the building by the contractor for the stonework, and who had shown exceptional faithfulness and skill. It was some time before we found him, but we finally traced him to a miserable tenement, where he and his family were quietly starving, in consequence of his faithfulness to his idea of the proper conduct of an American citizen. Being naturally of an independent character, and perhaps a little proud of his superior ability, he had never joined the stone-cutters' union, although often asked to do so. After his previous work on the building was finished, the union undertook to coerce him into joining. He resisted, and the power of the leaders of the organization was exerted to injure him. The stone-cutters' union was then perhaps stronger in the city than it is now, and the unfortunate man found all the shops closed against him. If a master, finding how skilful he was, were to hire him, all the other men in the shop were obliged by the union rules to pack up their tools and depart, and the only way to induce them to come back was to discharge the proscribed workman at once. When we found him he had been for weeks without work, and without prospect of obtaining any, but his independent spirit had not been crushed, and he showed no sign of surrender. We need hardly say that we engaged him at once for our work, which he carried out faithfully and intelligently, and we have never seen him since.

THE fear of this sort of proscription, which means hunger and nakedness to a working-man and his children, is very general in the building trades, and the managers of the unions have utilized the incendiary vaporings of the anarchists to spread a new terror, that of assassination, among their simple-minded fellows. Not long ago, the drivers and conductors on one of the New York street-railway lines struck, for some reason, and the company engaged other men to take their places. Hardly had the latter presented themselves for duty, when a crowd of women made their appearance on the ground, who, with tears and entreaties, tried to pull the new men, their husbands, sons or fathers, off the car platforms, calling upon the bystanders to help them, and crying out that the strikers would certainly kill their loved ones unless they were dragged by force away from the danger. That there was only too much reason for this fear, the annals of strikes in New York show, and there are few cities where the dread that some cowardly assault may be made on him, or on his family in his absence, does not now contribute to keep each member of the unions within the control of the unscrupulous men who assume the lead. If it were not for this, together with the dread of proscription and consequent starvation, the eight-hour movement in the building trades in the Eastern States would not have lasted a week. Even that time had hardly elapsed before symptoms of discontent and insubordination appeared. The most significant of these was perhaps the movement for the establishment of coöperative associations of journeymen mechanics, several of which were soon formed, and announced themselves ready for business. In Massachusetts, where there seems to have been most of this, the law now practically prohibits such associations, by compelling them to pay their members, or, in other words, to divide profits, once a week, so that, for want of sufficient surplus capital to enable this to be done, the smaller sort of employers are prevented from carrying on business, and the coöperative associations, excellent as their purpose is, have no chance of success, but the fact of their formation shows how slight a hold the eight-hour idea really has on the minds of American mechanics. It is needless to say that in a coöperative shop, working on profitable contracts, the idea of shutting the doors and banking the fire under the boiler for sixteen hours out of every twenty-four would seem ridiculous, and the men who would be admitted to such associations would have assuredly no idea of restricting either their industry or their earnings if they could see an opportunity for increasing both with safety. Another silent protest against the imposition of the foreign demagogues' notion of eight hours' work upon our mechanics is to be found in the exodus of the carpenters belonging to the striking unions from the city. It is related that the pickets sent by the leaders to intercept workmen coming into the towns to supply the places of strikers have fallen by mistake in some instances on the tools of members of the union, secretly stealing away to the country towns, where they can work as long as they like without molestation, and there is no question that strikes in the building trades are usually followed by this quiet escape of mechanics from the tyranny of their leaders to a freer atmosphere.

AFTER a struggle of twenty years' duration, the bill to authorize the construction of the Arcade Railroad under Broadway has become a law, by the approval and signature of Governor Hill of New York. Although the plan of the road has been long and thoroughly studied, and the project has been generally popular from the beginning, various circumstances have until now prevented the company from securing the approval of the State Government. The bill establishing the corporation has passed one branch of the Legislature twelve times, and has four times passed both branches, only to be vetoed by the Governor. Last year, however, after vetoing the bill, Governor Hill promised that if certain changes were made in it, providing that the City of New York should receive an income from the profits of the road, he would approve the scheme, and he has now fulfilled his promise. Under the present charter, three per cent of the net earnings must be paid as tribute to the city treasury, and great precautions are taken against interference with steam, water, gas or sewer pipes, or with the traffic on the surface of the street. Four tracks are to be laid, extending from the Battery to the Harlem River, one line running from Madison Square through Madison Avenue to the terminus, while the other will continue through Broadway. The trains are to be driven by electricity, and are to run at intervals of not more than two minutes, and at a speed of from thirty to forty miles an hour. The whole history of the enterprise so far seems to have been very honorable to

those who have managed it with so much patience and care. So far as the names of the directors of the company are known, they give assurance of economical and honest construction and management, and we think the citizens of New York are to be congratulated on the prospect of soon possessing a metropolitan system of railways unequalled by any in the world.

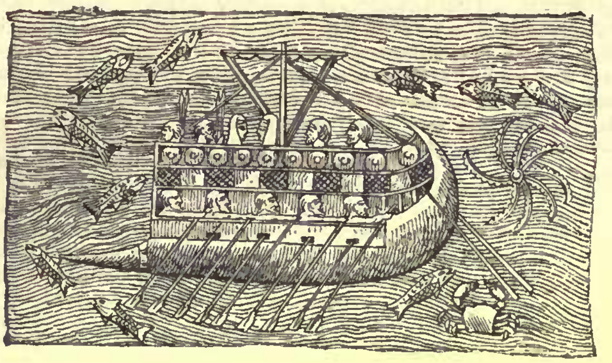
THE violent wind-storms which have swept over the country within the past two weeks have worked such havoc among badly built or decaying buildings as to call public attention very forcibly to the necessity for insisting on some better methods of securing the stability of structures into which innocent persons are crowded day after day. In Kansas City, the most distressing occurrence seems to have been the fall of a school-house tower, which had been for a long time regarded as unsafe, and had been twice condemned by the municipal authority. For some reason, it seems to be everywhere difficult to obtain the removal of unsafe structures, even after their condemnation, and this tottering mass of masonry was left, by the uncertainty and irresolution of the law, to fall down on the heads of a score of the little children whom the public authority had undertaken to protect and care for. Several other buildings of doubtful stability were demolished, burying in their fall men, women and children, the life of the least of whom was worth more than all the bricks in Kansas City. We know that no section of the country can claim any advantage over any other in respect of the energy with which the building laws are enforced, and will therefore refrain from criticising the remissness of the Kansas inspectors, but the reflection suggests itself strongly to our mind that if the people of that region should take it into their heads to apply to the execution of such statutes the impetuousness which is sometimes invoked to secure the punishment of offenders against other laws, and should give themselves a holiday for the purpose of pulling down all the cracked and leaning walls in the city, the result would be that good architecture there would receive an impetus that older and less impulsive communities would regard with envy.

A NEW sort of vaccination has been invented by Dr. Carlos Finlay, of Havana, for protection against yellow fever. It has long been supposed that the poison of yellow fever might be conveyed by inoculation, although no one appears to have wished to have the experiment tried on himself; but Dr. Finlay has applied to nature for a lancet more delicate than any human tools, and seems to have succeeded in this way in producing a mild form of yellow fever by inoculation directly from a yellow-fever patient. The process itself is simple enough. A mosquito is persuaded to bite a person suffering from ordinary yellow fever, and is soon after brought to a healthy person, whom, when his appetite returns, he bites without that previous wiping of his mouth which would be thought desirable in polite society. Without dwelling upon particulars, it is sufficient to say that the yellow-fever contagion was found, in six cases out of eleven, to be communicated to the healthy person, who, after the period of incubation had passed, became affected with various symptoms characteristic of yellow fever in a mild form. According to the *Lancet*, Dr. Finlay believes that this mode of inducing a prophylactic variety of yellow fever may be found very valuable in practice.

A CURIOUS illustration of the persistence of popular tradition seems to be found in the account of a discovery recently made in Italy. Not far from Siena is an ancient fortress, known as "the Mill." Perhaps the fortification may have developed from the defences of some ancient grist-mill, these establishments having been frequently fortified in the middle ages, but, however that may be, the name by which it is called is well known throughout that part of the country. Among the peasants of the immediate neighborhood of the Mill there is a common saying, which may be paraphrased thus: "Under Colonnata's mill, gold lies buried in the hill." The fortress has been in ruins for ages, and no one is known to have found any gold under it, but not long ago some antiquarian, whether led by the local tradition or not, we cannot say, undertook to make excavations on the site. For a long time nothing was discovered, but, the excavations having been pushed to a considerable depth, the workmen found at last, far below the foundations of the "mill," a dome-shaped chamber, with a ceiling formed of stone corbelled over, just like the Pelasgic Treasuries of Minyas at Orchomenos and Atreus at Mycenæ, which have puzzled archæologists since the time of Pausanias. There seems to be every reason to believe that the Siena treasure-house was built by the Etruscan relatives of the Pelasgi, at a period certainly not later than the sixth century B. C., and probably far earlier than this, so that the tradition of the existence of gold in it, which agrees precisely with the popular idea which calls both the Grecian examples "treasuries," seems to have been transmitted from generation to generation among the simple natives for at least twenty-four hundred years, and to have survived all the convulsions and conquests of the country, from the Etruscan period until now. It is very much the fashion among historians and archæologists to regard popular tradition as unworthy of the slightest attention, and we are perhaps disposed to be unduly credulous about such things, but we cannot help thinking that a collection might be made of such sayings of the kind as are not evidently modern inventions, which would be interesting, if nothing else.

ACCORDING to *Le Génie Civil*, pneumatic motors are so simple and easily managed that they have already become popular, and, although the first experimental station in the Rue Beaubourg, was only established last June, it already supplies seventy-two subscribers with power, and two hundred and forty applicants are waiting their turn for connection with the station. Most of the subscribers use the power for light machinery, such as is generally operated by a hand-wheel. A manufacturer of tortoise-shell combs, for instance, employs it to drive saws for cutting the teeth of his combs, and wheels for smoothing and polishing them, while many motors are connected with turning lathes, tinmen's shears, sewing-machines, and so on. As compared with hand-power, the force supplied by the pneumatic motors is cheap. The comb-maker, for example, finds that the exhaust system gives him the same amount of power as a hand-wheel, at one-half the expense, while the steadiness of the motor enables him to get more and better work done with his machines, than would be possible with the hand-wheel to drive them; while a manufacturer of brush-handles, who had been using five pedal-machines for boring the holes for the bristles, reports that by substituting belts from the pneumatic motor for the pedals his five operators are enabled to do as much work as eight would have done with pedals, so that an expenditure of three francs a day for the pneumatic power saves him three men's wages, amounting to fifteen francs a day, while the motor drives in addition a saw for cutting out the handles. The force is conveyed from the great air-pump at the central station to the subscribers' rooms through iron-pipes, with caulked lead joints, laid in the sewers, or in trenches in streets where no sewer exists. The individual service-pipes are of lead, with shut-offs at the entrance to the building, controlled by keys in the hands of the managers of the company, and couplings are provided for connecting the motors. Payment for power is made in accordance with the indications of a counter, which, however, is arranged in such a way as to take account of the power consumed, instead of the number of revolutions of the shaft. It might happen, for instance, that the brush-maker would for a time only need to use one of his boring-machines, and it would be obviously unfair to make him pay as much for this as if he required power for driving all five of them, although the speed of the shaft would be the same in either case. To provide for this, therefore, the counter is not attached directly to the shaft, but to a disk, revolving in a vertical plane, which is moved by contact with a small wheel revolving in a horizontal plane, and actuated from the main shaft. The small vertical shaft which carries this wheel forces, however, the piston of a regulating cylinder, communicating with the air in the motor. If a large amount of power is consumed, the air from outside flows in considerable quantities through the motor, nearly filling the vacuum, and allowing the piston, and with it the horizontal wheel, to rise toward the centre of the disk. The nearer it approaches this, the greater is the motion imparted to the disk by each revolution of the horizontal wheel, until the point is reached where all the power of the motor is utilized. If some of the machines driven by it are disconnected, the air-valve partially closes, the difference between the tension of the exterior air and that in the pipe becomes greater, and the piston of the regulator sinks, carrying with it the horizontal wheel, which being now applied nearer the circumference of the disk, turns it more slowly, and the counter registers a proportionately smaller number of revolutions.

ART IN PHŒNICIA AND CYPRUS.[1] — VI.



"WHOEVER," says M. Perrot, "may have been the primitive inhabitants of Cyprus, the earliest settlers known to history were Phœnicians. On this point the Greek tradition never varies from the times of Homer down to those of the latest historian of antiquity. The Iliad represents Cyprus to us as a land thoroughly Phœnician. . . . It was on the southern and eastern coasts that the Phœnician influence was first established, and there it had the longest dominion. The most incontestably Syrian towns in the island were Kition, Paphos and Amathos, and they were all on the south coast. . . . At first the Syrian colonists paid a tribute to the mother country but . . . the last ties which bound Cyprus to Syria as a subject state were broken by the struggles of the latter against the kings of Assyria and Chaldæa."

But there was also a close connection between the Cypriots and the Greeks. "It would appear that the Greeks were established in Cyprus a few years after the Trojan War, that is to say about the twelfth century, B. C." Proof of this may be drawn from literary sources, and also from the Greek inscriptions found upon the island. "It is certain that the incursion took place before the Hellenic world began to make use of the Cadmean alphabet, that is to say, before it began to note the sounds of its own language by letters taken from Phœnicia. If the new colonists had brought this useful instrument to Cyprus with them, we should not have found them employing, down even to the Persian domination, a peculiar system of writing which the syllabic value of the signs, and the absence of soft consonants, made but ill-fitted to their own idiom. And where did they get this system of signs, a system comprising some fifty-five different characters? When they wanted to write the Æolian dialect, which appears to have prevailed in the Greek part of Cyprus, did they adopt characters from the cuneiform syllabaries? Or, as scholars are now inclined to think, did they take them from the Hittites? This is hardly the place to treat such a delicate question. . . . But from certain indications it appears likely that the characters we are discussing were invented in Asia Minor, and used there many centuries before the Phœnician alphabet. . . . Over the whole peninsula this imperfect system was superseded in the ninth or eighth century, B. C., by the Phœnician alphabet; the former survived only in Cyprus. It is curious that the last Greeks to adopt the new letters should have been those living in the closest contact with a Syrian community." And the fact is interesting as emphasizing the intellectual independence of the Cypriot Greeks, and preparing us for that Greek admixture which is strongly apparent in island sculpture.

The Greek and the Phœnician cities seemed to have kept themselves singularly independent of each other. Kition and Amathos, for example, "remained Phœnician until the day when the victories of Macedonia brought the whole East within the Hellenic system;" while Salamis was always purely Greek. "Not a single Phœnician inscription has been found in it; neither has it yielded any of those queer objects of earthenware and terra-cotta which have been recognized as Phœnician," and which in the Phœnician cities date even from Roman times. "The oldest things from Salamis recall the style of Mycenæ."

Of the earlier political condition of the island we have little knowledge. The Greek cities seem to have enjoyed a maritime supremacy in the neighborhood of the ninth century; but though their material prosperity was great in all later times, they seem to have had little thought of regaining it when once they had lost it. They even seem "to have been in some degree careless of their independence. Twice only in a long series of years do we find them making any real effort to reconquer it. The Greek cities showed no united front to a foreign master . . . and none of that love of a Republican form of Government . . . which distinguished the communities of Hellas proper. They were always ready to accept a monarchy; and so too they resigned themselves into the hands of any great Oriental emperor who might happen to have the upper hand for the moment. . . . Even now, the Greeks of Cyprus are more indifferent to the pan-Hellenic idea than those in any other part of the Levant. They were always the easiest subjects of the Turk . . . and in Cyprus, England has no cause to fear the hostility which never slumbered in the Ionian Islands until she surrendered them to Greece."

[1] *History of Art in Phœnicia and its Dependencies.* From the French of George Perrot and Charles Chipiez. Translated and edited by Walter Armstrong. In two volumes, illustrated. London, Chapman & Hall, Limited. New York, A. C. Armstrong & Son. 1885. Continued fromNo. 539, page 199.

Even when, in B. C., 502, the Cypriote Greeks joined in the Ionian revolt against Persia, the Phœnician towns refused to help them; and they failed to gain their liberty partly for this reason; but partly also, we may believe, because they felt themselves more closely bound to the Asiatic Greeks than to those of Hellas proper.

"All antiquity is unanimous as to the soft, effeminate and dissolute mode of life of the Cypriots." Their climate was luxurious, their soil so fertile that great efforts were not needed. "The desire for the best, the instinct of progress was not readily awakened. . . . In spite of its Grecian population Cyprus cannot claim to be the nursery of any school of poets and artists," as, we know, were so many smaller islands further north. No great poet, sculptor or painter called Cyprus mother — no single great man, indeed, save only Zeno the philosopher. Yet she had great artistic importance of another sort. Her place was on the line where the East joined the West. Within her boundaries met those two great currents of influence which, perpetually warring together, were yet perpetually exchanging ideas out of the mixture of which later and greater developments were to grow. "For the vegetable world," says M. Perrot, "Cyprus was a great *jardin d'acclimatation* wherein a hundred valuable plants — including the vine — were first accustomed to a somewhat more rigorous climate, and afterwards carried to all the south of Europe, and thence to America even." And something very similar may be said of her with regard to art and to those religious ideas which so potently moulded art for the reason that its chief end was their expression. "Her action may be studied with the greatest ease and completeness in her sculpture." Although her architecture has disappeared, yet "from her ruins and graveyards a whole art has emerged, and that an art very curious and national, an art of whose existence Winckelmann had no suspicion; an art whose interest and importance were not even suspected by Gerhard, who was living less than two decades ago."

Most of the Cypriots' statues are executed in a fine limestone, inferior to the marble of Greece, but far superior to the materials which offered in Phœnicia proper. Bronze they also used, but for obvious reasons the works which have come down to us in this substance are few and small. Plastic clay was plentiful and good, and was admirably managed in life-size figures and vases of exceptional magnitude. Greek influence is apparent in the fact that it seems to have been very rarely enamelled. Wood also must have been largely employed, but its results have utterly perished.

Assyrian and Egyptian influences, received not at first hand, but through Phœnicia as an intermediary, lay at the root of Cypriote art; but local peculiarities are immediately apparent. The fundamental influence seems to have been Egyptian, in spite of the fact that the earliest works are those which in details of costume are most Assyrian in aspect. From Egypt came the love of works in the round, never characteristic of Mesopotamian sculpture. Cypriote modelling was not so strongly accented as Assyrian. "The fine taste of Egypt peeps out in a general breadth of execution, in the treatment of the nude, and even in the form and handling of head-dress and drapery." Later on even the superficial following of Assyrian precedents gives way before the influence of Egypt. "No more long robes hiding all the natural contours. In some statues we find the semi-nudity of Egypt . . . but more often the body is covered with a clinging short-sleeved tunic, under which the forms are scarcely less visible than if they were nude." And the decorative details—the ornamental bands and borders worked upon the garments — show very clearly the paramount rank which Egypt now held in the island sculptor's affections.

But, as I have said, this compound borrowed art is marked by peculiarities quite its own. For example, most of its figures are extremely flat from back to front and are carefully finished on the front side only. They were works in the round, but yet were not intended for entire isolation. They were meant to be set upon pedestals ranged against the walls of a temple, or placed back to back in parallel lines down its area. Again, while we find at first a desire to reproduce the high-nosed type of the Assyrian race, we soon find this abandoned in favor of a more Egyptian cast of countenance. Yet the imitation is not servile. "The mouth, which is horizontal in works of the earlier period begins to turn up at the corners, giving birth to the peculiar smile which characterizes archaic Greek sculpture, a detail of expression which is no less strange to real Egyptian art than to the pure style of Assyria." The comparative lateness of Cypriot art is shown by this single fact. When it developed Egypt and Assyria no longer ruled alone in a world of outer barbarians. In nearly all the island statues, says M. Heuzey, "the action of a third element, and one of different origin may be traced. And this element is the archaic art of Greece as it existed toward the end of the seventh century in the islands and colonies of Asia, itself bearing traces of its half-Egyptian, half-Asiatic education, combined with a rude though powerful originality of its own. We have shown that the influence of Greek archaism was felt very early even as far as Phœnicia; still more, then, must it have made its way in an island peopled in greater part by a Greek race."

The defining of this influence seems to me one of the most valuable services done by the volumes before us. Eyes obliquely set and a mouth raised at the corners are known to us, in life, as race characteristics of the very farthest East; so, when we have seen them in archaic art, we have been quick to call them "Oriental" characteristics, and slow to remember that they have no place in those Oriental arts from which Greek art certainly drew much of its inspiration. "The obliquity of the eyeball," says M. Heuzey, and, following him,

M. Perrot, "does not appear in the art of Egypt, Chaldea or Assyria until a comparatively late date, and then is mostly confined to attempts at figuring the human profile. . . . In Assyrian bas-reliefs it seems to be no more than a conventional way of expressing the vanishing perspectives of the eyes as seen in full face, for it is not to be traced in heads in the round in the same period. . . . In the archaism of Greece alone do we find it adopted in a constant way. . . . It is in reality" (not an effort to express race characteristics at all, but) "no more than a pure affectation, one of those conventions by which art sometimes thinks it can add to the beauty of the human form. It seems to me to be part of the great original effort of the young art of Greece to give animation to the face. The artist drew up the corners of the mouth in an exaggerated smile, and then, observing that he had broken in upon the equilibrium of the features, and obeying an impulse toward parallelism, he turned up the eyes in the same fashion and made them grin with the mouth." Such details have a much more than merely technical importance. With the grotesque smile of the earliest Greek-influenced terra-cottas of Phœnicia and Cyprus begins the period of true *life* in sculpture — of animation, expression, individuality and psychical meanings; and in the contrast between them, technically imperfect and childish though they are, and the technically admirable statues of Egypt, expressing merely a supernatural repose, a superhuman calm and immobility, is typified the whole difference between the life and character of Egypt and or Greece — between the old, wholly dead world of caste and bondage and convention, and that newer world of freedom and individuality and intellectual life which is the true parent of the world that still is to-day. I do not forget that there was a time in her very earliest ages when even Egypt's sculptors had showed aspirations of a similar sort, and great skill in their realization. But it was not from them that Cyprus borrowed the vital principle which was to blossom into such splendor of life; her borrowings from Egypt were of another sort — technical, rather than intellectual, spiritual. It was the nascent soul of Greece which worked its own new way to existence under the touch of Cypriote chisels. And I may add that not only in the face but in the drapery of the island sculptor we see its signs. Very often his folds are purely Assyrian or Egyptian in character; but often, too, they show the beginnings of the freer treatment characteristic of the art we call Hellenic.

Hellenism became more and more the predominant influence as the years succeeded one another. The fully-formed Cypriote style, "like that of Etruria, was a branch of Greek archaism. Asiatic traditions naturally had more to say to it than to purely Greek art, and they were preserved from total disappearance by the influence of a national type which was itself considerably mixed. . . . This type," —always discernible, though most strongly marked in earlier periods —"lacks elegance and nobility. It has neither the grave and honest look of the Egyptians, nor the truculent energy of the Assyrians, nor the purity of line which Greek artists set before themselves from the very beginning. . . . The cranium is high, the skull narrow, the forehead slightly retreating. The eyes are large and prominent, the cheek-bones salient, and the cheeks often hollow. The nose is strong and large toward the end, the chin large and heavy, the small, plump mouth not without a dash of sensuality. . . . These Cypriote heads have neither vigor nor refinement. They betray a soft heaviness of character which agrees well with the history of the race to which they belong." They go far, in truth, to point the meaning of a scornful term that the classic authors often used — *Cypriote ox.*"

It has seemed better thus to abridge M. Perrot's generalizations with regard to Cypriote sculpture, rather than to try and follow him in his description of the various relics upon which his conclusions are based. To begin with, any one may study these for himself, either at the Metropolitan Museum or in the admirable reproductions published by Messrs. Ticknor & Co. And in the second place, the value of the statues is less individual or intrinsic than aggregate and historical. They interest us chiefly because they bring to light a great connecting link in the chain of ancient art — that link which unites the purely Egyptian and Assyrian developments with the purely Hellenic, and shows all three as mingling and blending together. The importance of Phœnicia proper to the historian of art is that of a transmitter of ideas, an intermediary between nations old and new. The importance of Cyprus is of a different kind. She received from the old world on the one hand and from the new world on the other — was herself, indeed, half Oriental, half Hellenic — and fused their gifts into an individual and most interesting, though not very beautiful or significant art of her own. Of course the perfect art of Hellas proper did not actually *descend* from the art of Cyprus; it was rather a parallel development, of somewhat later date. And yet the interchange of influences must have been constant, and in any case the art of Cyprus stands alone in its power to show us to-day how the Greek genius went to work in the earlier stages of its development.

And, as I have hinted, it shows us also how this genius went to work in appropriating and modifying those religious ideas which it received from the East, and which had so strong an effect upon artistic effort. But in this connection I can only refer my readers to M. Perrot himself. I have not even left myself place to speak of his full chapters upon gem-cutting and the various industrial arts, though they are well worthy of close attention.

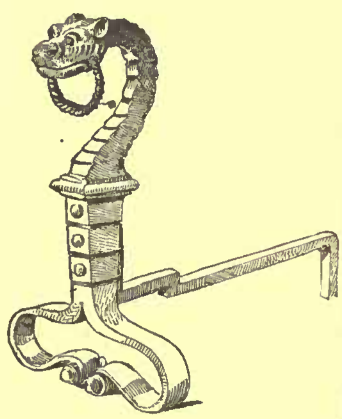
Yet valuable and interesting as are these volumes, we cannot quite say of them what we may say about their predecessors. They do not give us a complete and authoritative account of Phœnician art which we may feel sure will not be upset or radically modified by future discoveries. That which the future explorer may unearth in Phœnicia or her dependencies may possibly modify or disturb, instead of confirming some of the details of the knowledge we think we now possess — partly because, as I need hardly state, the explorations of the past have not always been conducted in a thoroughly scientific spirit. Certain foreign critics, indeed, think that M. Perrot himself has been too credulous upon many points, especially as regards the jewelry, etc., in the Cesnola collection. But he himself explains that his beliefs and the theories based upon them are of a somewhat tentative, provisionary character. And at all events we may say that the present volumes are by far the best to which the general student can as yet turn for information upon the subject; and also that he owes their authors a double debt of gratitude, inasmuch as their task was far more difficult than with the preceding ones, involving as it did the study of a vast mass of uncodified evidence, and the risk — agreeable enough to a mere polemic writer, but not to a professed historian—of putting themselves on record with opinions which may soon have to be conspicuously modified. I may add that in these long chapters of mine I have tried to avoid all commenting upon those minor disputable subjects into which Messrs. Perrot and Chipiez were obliged to enter, and to reproduce only such main points and general opinions as are pretty well established to-day.

It is a matter of regret that Mr. Armstrong's translation should not be entitled to such unqualified praise as was due to his preceding attempts. The style is often slipshod and awkward, and misprints are extremely frequent and sometimes of a very confusing sort.

M. G. van Rensselaer.

LECTURE ON ARCHITECTURE.[1]

PART I. ON THE THEORY OF PROPORTION IN THE ARTS GENERALLY, AND PARTICULARLY IN ARCHITECTURE; AND WITH FURTHER SPECIAL REFERENCE TO THE STUDY OF GREEK ARCHITECTURE.



Fire-dog for Mr W. T. Wilson's House. Messrs J. A. & W. T. Wilson, Archts, Baltimore, Md.

THE art of the Greeks, whether in sculpture or architecture, and no less, indeed, in all branches of their poetry, Epic, Lyric, or Dramatic, has always been recognized as excelling by harmony of proportion, and as distinctively ideal. These terms — the ideal, and harmony of proportion — are more frequently paraded rhetorically than defined. It is either taken for granted that their meaning is too well understood for explanation to be necessary, or we are put off with generalities or flourishes which benefit little. The meaning which they do cover lies at the root of the subject of the present lecture, and it is all-important to obtain a somewhat firmer grasp of it.

Proportion concerns relative quantities — which may be quantities of anything, according to the nature of the art which is in question; and what proportions will be harmonies cannot but be largely dependent upon the subject-matter to be dealt with. It may be possible, as we shall see, to lay down some very broad principles which shall apply to harmony of proportions in all the arts; but when specific application is in question, it is to be expected that every art will have its proper conditions of harmony. Some of the wildest woolgathering over these speculative fields has been due to the neglect of such peculiar conditions, and to the resolution to impose the principles of one art upon another.

In any case, perfection of proportion is not something distinct from ideality in art, but is characteristic of it. The theory of the ideal in art has not been rendered clearer by the long-established predilection for connecting it with the more fanciful speculations of ancient philosophy. All things which exist, it was propounded, had preexistence in their causes, corresponded to ideal archetypes in the mind of the Demiurgus, or great artificer of the world, and once had been within cognizance of the soul while it was yet free from the sufferings and soil of earth. Not only all positive objects, but all abstractions had representatives there in purity and perfection — perfect truth and perfect beauty; and the great end of human study and discipline was to get clear of the clogs and embarrassments of material existence, and by the purest of all initiations attain once more to the bliss of unclouded intuition and absolute knowledge. The mysticism which accrued around these speculations need not be pursued further; it pervades Platonism in all its later as in its earliest forms and penetrating the scholastic philosophies emerges for its utmost glorification in the poetry of Dante. And not alone to poets and metaphysicians, but no less to rhetorical critics, has it ever been tempting —

> To soar with Plato to the empyreal sphere
> To the first God, first Perfect, and first Fair.

[1] Lecture read at the Royal Academy of Arts, by W. Watkiss Lloyd, on March 4, 1886.

But our present point of view is bound to be not poetic, but prosaic; we require not tropes and figures, but definitions. We are led in consequence to recognize that it was from the blended operations of the imagination and intellect of the artist, that the philosopher modelled his type of the Demiurgus. The processes and qualifications of the creative faculty of gifted man were transferred to the conception of Divinity. The original notion so far accurately represents a fact, that the production of a truly great work in any art is due in the first instance to an antecedent idea, to a generative conception in the artist's mind; and to such an idea as from material hindrances, is after all too frequently, but imperfectly realized. The development of such an idea may be progressive — but all that is most important is virtually pre-existent in the original germ. The same principle holds good in art, which the more sober Aristotle enunciated relatively to animated organisms; the whole, he said, is anterior to the parts — that is, the number, nature, and collocation of parts or members, are dependent upon the conditions which their predetermined coöperation necessitates.

An artistic idea is a combination of the same elements which are included in all mental experiences, only in heightened force and in an elevated degree; it has common relation to Thought and to Passion; or otherwise stated, it is intellectual on one side and moral on the other. And the work which results is a work of fine art in virtue of the intellectual element, however distinguished, being in decided subordination — being essentially ancillary to the moral — to the realization of a certain specific tone of moral expression. By moral expression I mean style; style as equivalent to some certain, well-defined grade in that scale of characteristic dignity, which extends from loftiest sublimity and beauty through degrees and varieties of nobleness, elegance, gracefulness, nay, prettiness, even, to the quaint, the humorous, the grotesque.

From the immeasurably superior interest and importance of the grandest style, the term ideal art has tended to become restricted to this alone; but, in truth, every work in art which has a consistent style, and attains to a certain degree of perfection, is so far entitled to be termed ideal, as owing its birth to a true effort of imagination. This must be allowed, though we shall not, in consequence, be committed to the mistake of coördinating perfection in a lower style with perfection in a higher. The original conception may be seriously at fault, and then the claim to ideality is cancelled; the pretended sublime may be bombastic, extravagant, overcharged; what is intended to be embellishment may be tawdriness; the tranquil only unsufferably dull, the grotesque revolting.

Or otherwise, whatever the value of the conception in the artist's mind, the work, at last, may be defective from lack of executive skill. Wordsworth liberally concedes "the vision and the faculty divine" to many who are so far poets, but —

Wanting the accomplishment of verse; —

and so, in other arts, how many are the original productions which seem to have the merits inseparable from copies of really fine works, but alas! the faults also of poor copies.

Purity of style, therefore, and a high standard of development within that style, with adequate and admirable execution, entitle a work of art to the honors of the ideal. Such a work is, in its degree, a concrete realization of thought and feeling, touched to fine issues; it is only due, as already stated, to the vast interval which separates the loftiest and the least important examples, that ideal art has become restricted in ordinary language to the highest art of all.

A true work of art, therefore, has relation as a whole and in every part, to an inspiring and controlling idea; and this relation, upon which harmoniousness and purity of effect depend, is a matter of proportion among those parts or characteristic elements, and relatively to the whole. Due relation, due keeping, due subordination, preservation of the values, these are all familiar, well-understood phrases which the simplest analysis reduces to the *single quality* of due proportion.

What proportion does not decide is the nature of the parts or elements themselves, in the first instance, to which it is applicable. The general nature of these will vary, of course, with every art; they may be combinations of audible notes in one, selections of tints and shades in another, graduated outlines or masses in other instances; and every particular work will be made up of special combinations, with limits within which they offer themselves for modification in proportionate distribution.

Here, therefore, we distinguish a qualitative as well as a quantitative harmony. Harmonious composition depends on the fitness of the kind of elements which are brought together, as well as on the fitness of their relative masses, dimensions or intensities. To take an illustration from mechanism, in a chronometer or a steam engine, a certain variety of appropriate parts are to be contrived in the first instance, and then adjusted to each other by appropriate relative dimensions and positions. The same sets of members and organs which make up the very effective organism of a bull-dog are repeated in a staghound, but varied throughout in relative proportions. If we compare the staghound with the stag, we find the elements which enter into the combination are now materially varied in kind, but still appropriately; and the different kinds of elements, as hoofs, claws, horns, etc., are in each case harmoniously adjusted in proportionate magnitude to their special associates. In the composition of a picture, in the same way, the selection of appropriate tints is antecedent to the application of them in due relative collocation and frequency and force. And so in architecture, each harmonious style is primarily harmonious in virtue of its members and ornaments, making up a set suitable for the proper architectural requirements; and afterwards so regulated by proportion among themselves, as to give full effect to the purposes both of convenience and beauty for which they are contrived and brought together. The most important architectural works of the Greeks were temples, chiefly of the Doric style, and of these the most finished and studied were by Athenian architects in Athens and Attica, and one other erected at Bassæ in Arcadia. A Greek temple is a structure of which the primary and simple purpose is to house the statue of a god or goddess — to house it worthily and characteristically. It is possible that originally it was supposed to be the actual residence of the unseen divinity. There are traces in the history of other nations of such an idea. A secluded apartment is a sort of Holy of Holies — only entered by the priest — by him only at certain times, and then for direct intercourse with the God, for services of propitiation, or to obtain oracles. There is a hint of such a lingering notion in Homer when he tells how the Goddess Athene retires to Athens and there enters, as if for permanent residence, the "closed house of Erechtheus" — the original of the Erechtheum, which, in historical times, comprised the temple of Athene Polias and became the depository of her most sacred effigy. The word *νάος* applied to the temple generally and especially to the most sacred division of it, and signifying properly a dwelling, preserves another hint of such a notion.

At the epoch which we are concerned with, the naos — an apartment to lodge and protect the statue of the God or Goddess — is the main element of the structure; another subordinate was sometimes attached — an apartment which serves as a treasury — in modern phrase, rather in the first instance as a sacristy, a room for safe deposit of the objects of value dedicated to the divinity and its service, when not required for display.

It is following out the primary idea of a dwelling which suggests that the dignified apartment shall not be entered directly from the surrounding open area, that there should be a portico in front of the entrance and even an antechamber also; in fact, a hall and a porch. Such is the form of earlier simple temples. Afterwards, enhancement of dignity was sought by carrying a portico entirely round the building; this is at once an exhibition of lavish enrichment and emphasizes the seclusion of the naos. It was reserved for later times to seek still further enhanced effect by carrying a double range of columns all round.

The same sense of the appropriateness of giving distinctness to the sacredness of the structure suggests that it shall be raised more or less above the level of the surrounding area by a podium, and that the sacred apartment again should be raised by steps above the portico.

That the plan of the main apartment should be an oblong with the entrance at one end, is suitable to the purpose of allowing room for spectators in front of the chief object of interest.

Such, then, were the simple elementary members which governed the plan of a Greek temple; already, consideration of the relative dimensions to be given to the naos in length and breadth, to the antechamber or pronaos, to the portico on front and on flank, involves considerations of proportion. These must be controlled importantly in particular cases, by the general magnitude which is contemplated for the building; as the same proportion may manifestly not be suitable for a large and for a small apartment; and then in some degree by the nature of the materials to be employed, and the general system of construction. But after these have been fully allowed for, a wide choice is still left open between one definite dimension and distribution of dimension, and others, and it is upon decision as to definite dimensions that all the artistic effect which is derivable from proportion depends. We have to choose one set of dimensions out of any number of others which will be equally convenient; and we require some principle which will guide, or help to guide, us to the most dignified or most beautiful, being at the same time characteristically appropriate.

The consideration of the architectural members of the elevation will bring us to the same problem of reference to proportion, which is presented by the plan. For anything that is to be learned from history or archæology the Doric style of architecture may have come into the world complete in all its members and attributes, like Athene from the head of Zeus. We have examples of it which are comparatively rude — such is the temple at Assos so thoroughly explored and published by the Americans — but we do not come upon one in the embryonic stage; all the members which pertain to the most perfect examples are there, and not any other; the differences, and they are such as to induce contrasts almost as glaring as between clumsiness and grace divine, are mainly due to differences of proportion.

It is possible that early Greeks may have been familiar with the imposing effect of Egyptian avenues of columns, and so have been influenced in giving development to their own colonnades; but otherwise their Doric presents no detail which indicates Egyptian origin — none of which the similarity is not explained as a common suggestion of a common constructional requirement. The architecture of Egypt is stone, and that of Greece betrays throughout its derivation from timber architecture. It is a wooden architecture translated into stone under the altered proportions imposed by the new material, especially in respect of the bulkiness of columns and the span which open bearings could safely be extended to. The vase paintings preserve representations of the slender columns of purely timber Doric, but otherwise exhibit the same members and details.

In the elevation, as in the plan, considerations of qualitative harmony precede those of quantitative. There is the same question of deciding that a certain kind of member is indispensable or appropriate before we come to the question what precise dimensions shall be assigned to it relatively to those in immediate association.

The Doric column is a pillar diminishing from below upwards; the broader base is expressive of stability for the mass as independent, and also as ensuring steadiness until the architecture is placed upon it. A horizontal plate on the top of a wooden shaft would distribute the pressure of superincumbent weight. The triglyph has always been understood to represent the end of a cross-beam resting upon the architrave. The mutule represents the projecting end of a flat wooden tenon driven hard into a mortise crossing a joint; and the dentils owe their origin to heads of trenails driven through it on either side, into the under surface of the covering and projecting cornice.

These elements of construction in the hands of some primæval artist — some genius, I will say, worthy to take rank in no remote class from Homer in poetry and Phidias in sculpture, were reduced to order and expressive symmetry.

The triglyphs were increased in number and spaced regularly both over the columns where they covered joints and certified bond, and intermediately; in like manner the mutules were still further multiplied and accentuated the regular distribution of the triglyphs and their intervals; and regular subdivision reached its limit in the close-set rows of dentils.

The expression of the column as responsible for resisting down-press, was enforced by vertical channels, by fluting; and the principle was extended to the grooves which gave their name to the upright triglyphs.

The projecting cornice might be called the analogue of a capital to the general order, but that its functions of shielding the order from above is too special to be so subordinated; the capital, indeed, was so treated by the spread given to it beyond reference to transition to the architrave that it assumed itself the characteristic of a cornice. Such, then, are the members of the Doric order, and in broad outlines they are repeated like those of the plan in the Ionic — as columns erected upon a raised podium are spanned above by the architrave — above this is the frieze which represents or covers the ends of the cross beams; and the entablature is completed by a cornice which projects to carry off rainfall clear of both entablature and column.

But the spirit, the proper style, the moral expression of Doric architecture, is the utmost severity that is consistent with grace — of Ionic, as much grace as is consistent with dignity. The sternness of Doric declares itself in the general predominance of massiveness; in the frankness with which the triglyphs express the constructive articulation, in the paucity of subordinate mouldings, and those distinguished by breadth and boldness. In Ionic architecture slenderness prevails, the void intervals are more open, mouldings are multiplied and diversified, and are introduced to soften all angularities of transition, assume more varied curvature, are frequently richly carved, and in the capitals developed with elaborate enrichment.

It is clear that any general theory of architectural proportion may be called upon to justify itself as being equally applicable to both these contrasted styles; but this is too wide a range for the present occasion, and there is quite sufficient scope for illustration of its elasticity in the various examples of that Doric templar architecture in which Greek genius achieved its noblest triumphs. It is in the greatest of these — in the Parthenon — that we can follow forth the most complete illustration of the theory and of its flexibility. Here it is that we obtain revelation of principles which do not constitute an invariable norm, but instead of excluding variations lead themselves to variations most diversified.

More than one of the great Greek architects is reported to have left treatises on the proportions of the buildings, temples chiefly, which they erected. These literary works are lost, and it is much if an occasional detail derived from them is preserved among those precepts which Vitruvius lays down for the practitioners of his day — precepts which are all but universally at variance with Greek practice. What the theory really was upon which the great architectural geniuses of Greece based their practice is to be sought by interpretation of the ruins of their executed works. In these works we have the equivalent of the original illustrations of the lost treatises. One set of such illustrations is particularly valuable; it is embodied in the plates of the work on Athenian architecture — the Parthenon and Propylæa, which was executed with exhaustive thoroughness and minutest accuracy by Mr. Penrose for the society of Dilettanti. Only second in importance is the volume on the temples of Bassæ and Ægina, by the late Professor Cockerell. From these records of the executed works of the great Athenian architects, it ought to be possible for us to elicit by examination and study whether they really employed a system of proportion in design, and what it was. But, indeed, our chief interest is to discover what their system was; for that there was such, and also that it was based upon principles not fanciful but rational, might be safely assumed from that harmony of their architecture which has ever been recognized with admiration, and spontaneously by all beholders.

I believe that I shall be able to convince you that the secret has been penetrated. When I shall have set this forth it will remain for ever to demonstrate what my limits will forbid me to enter on, that the same system is perfectly applicable to other styles; and that much that is excellent in later styles has been due to an instinctive approximation to it, standing in the place of reasoned science.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE ROTCH TRAVELLING SCHOLARSHIP DRAWINGS.—PLATES IX, X, XI, AND XII.

[Issued only with the Imperial edition.]

BURLINGTON COUNTY COURT-HOUSE, AT MOUNT HOLLY, N. J. ADDITIONS AND REMODELINGS BY MESSRS. HAZELHURST & HUCKEL, ARCHITECTS, PHILADELPHIA, PA.

THIS building was originally built in 1796. The clerks' office and surrogate's office were added in 1807. The buildings are in the centre of the town, on the principal street, in an open park or square, and are excellent examples of colonial work, both inside and outside, the material being brick and stone. The additions to old building were placed in rear, so as not to mar the beauty of the old work, and were carried out in exact conformity with its style, but at the same time being made thoroughly fireproof, the I-beam and brick arch being used in floors. These new portions of building are used as record vaults, library, clerks' office, judges' room, etc. Actual measurements of all old work, such as cornices, etc., are made to attain harmony in design. This work has recently been completed, and the sketch shows old building as it now appears, with new work added to rear.

STUDY FOR A SWISS COTTAGE. MR. JULES F. WEGMAN, ARCHITECT, CHICAGO, ILL.

THE sketch represents a study for a Swiss châlet on the American plan, well adapted for this climate, the chambers being well supplied with the verandas common in Swiss châlets. The basement is of stone, and contains ample space for cellars, laundry apartments, refrigerator, etc. The first and second stories are of wood, the outside walls of the second and attic stories being covered with cement and gravel, or plaster and gravel, which is very necessary to give the house a Swiss character.

SKETCH FOR A MOUNTAIN HOUSE. MESSRS. ANDREWS & JAQUES, ARCHITECTS, BOSTON, MASS.

HOUSE FOR DR. W. B. PARKER, MARLBOROUGH ST., BOSTON, MASS. MESSRS. H. W. HARTWELL & W. C. RICHARDSON, ARCHITECTS, BOSTON, MASS.

SKETCH FOR GYMNASIUM, PHILLIPS ACADEMY, EXETER, N. H. MESSRS. ROTCH & TILDEN, ARCHITECTS, BOSTON, MASS.

THE MORTIMER BUILDING, NEW YORK, N. Y. MR. GEORGE B. POST, ARCHITECT, NEW YORK, N. Y.

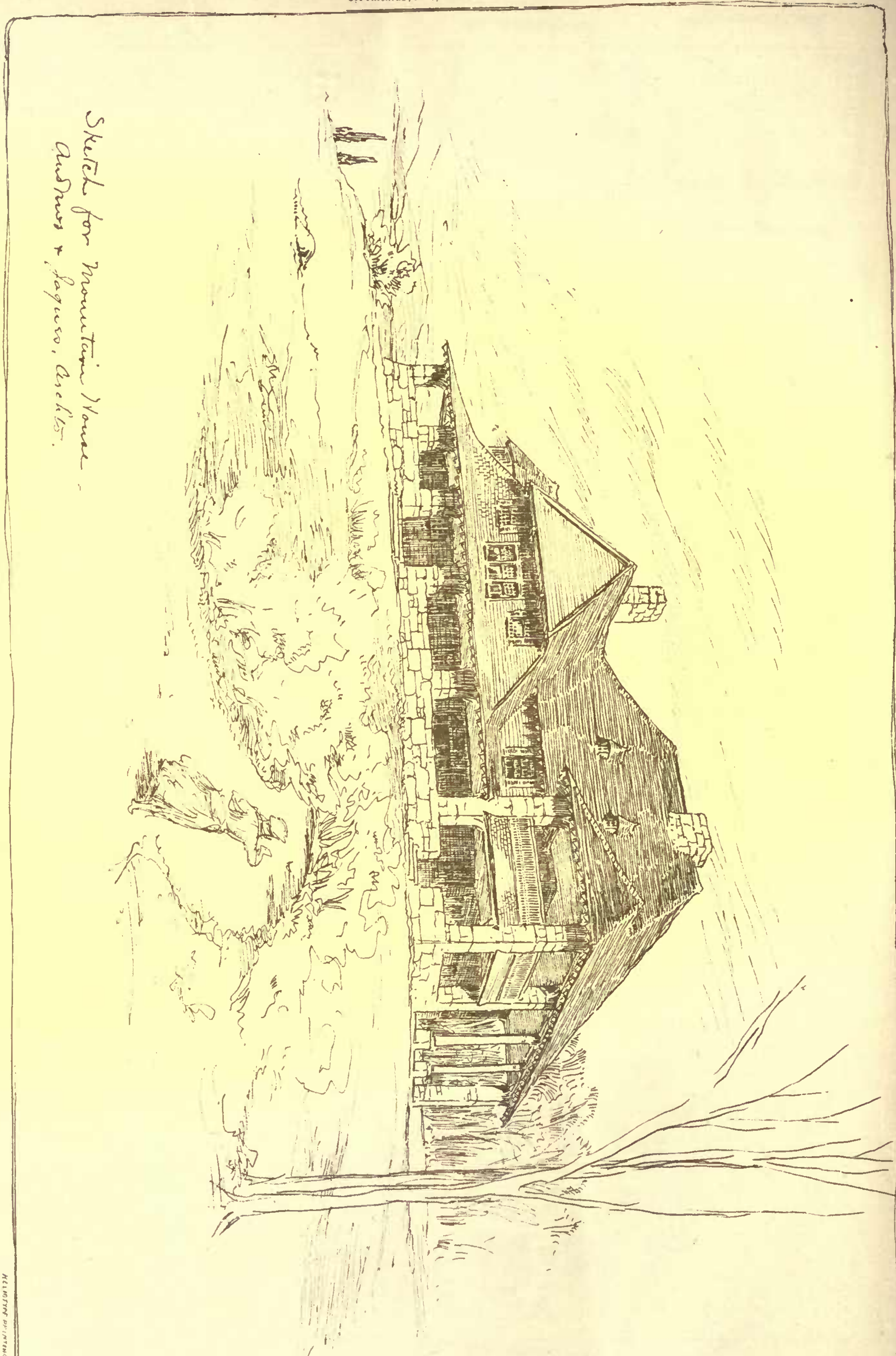
SIR EDMUND BECKETT ON SCIENCE AND ART.



BEFORE presenting the prizes awarded after the examinations in the St. Alban's School of science and Art, Sir Edmund Beckett, who resides in the neighborhood, delivered a lengthy address. Some of the more striking portions may be interesting to our readers: —

If I were only to do my duty — all that is formally required of me — I should simply present the pupils with the prizes; but I am afraid they would be disappointed if that was all I did, for there is a passion for talking which distinguishes Englishmen and English women, which has caused a number of my hearers to come here. I have seen an archbishop, in distributing prizes, try for an hour to vary the monotony of telling young gentlemen and young ladies of the pleasure he had in handing them their prizes, but he was not particularly successful, and therefore I will not attempt to do that. Perhaps the best thing will be that I should make some general remarks beforehand. I must confess, however, that I am in a state of extraordinary ignorance on the subject. Science is a very good thing, and art, in its way, is a very good thing too. But I am afraid that the meaning of both words is a good deal less understood than

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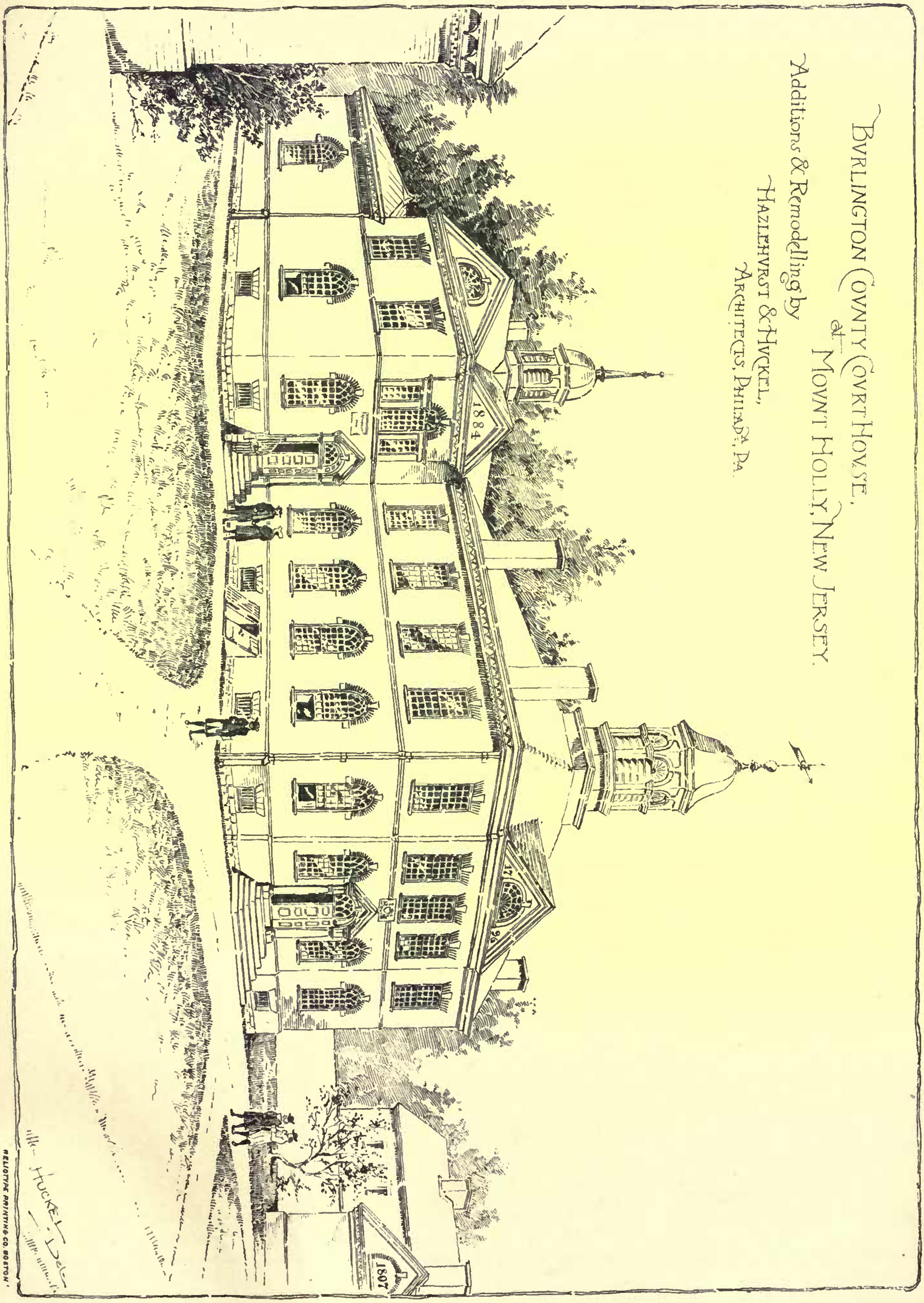
House for Dr. W. B. Parker: Marlboro St. Boston.

Messrs H. & V. Hartwell and W. C. Richardson · Architects ·

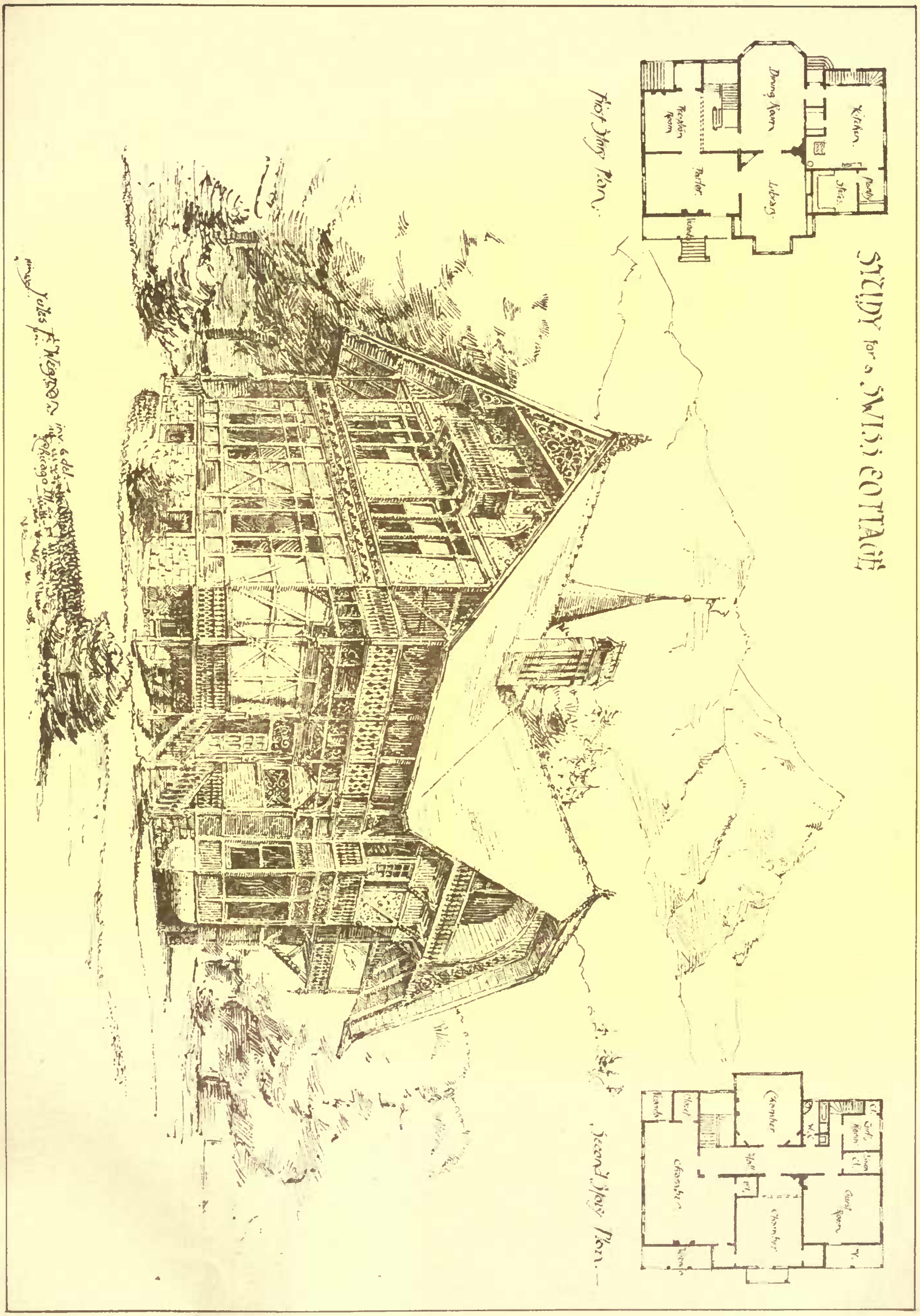


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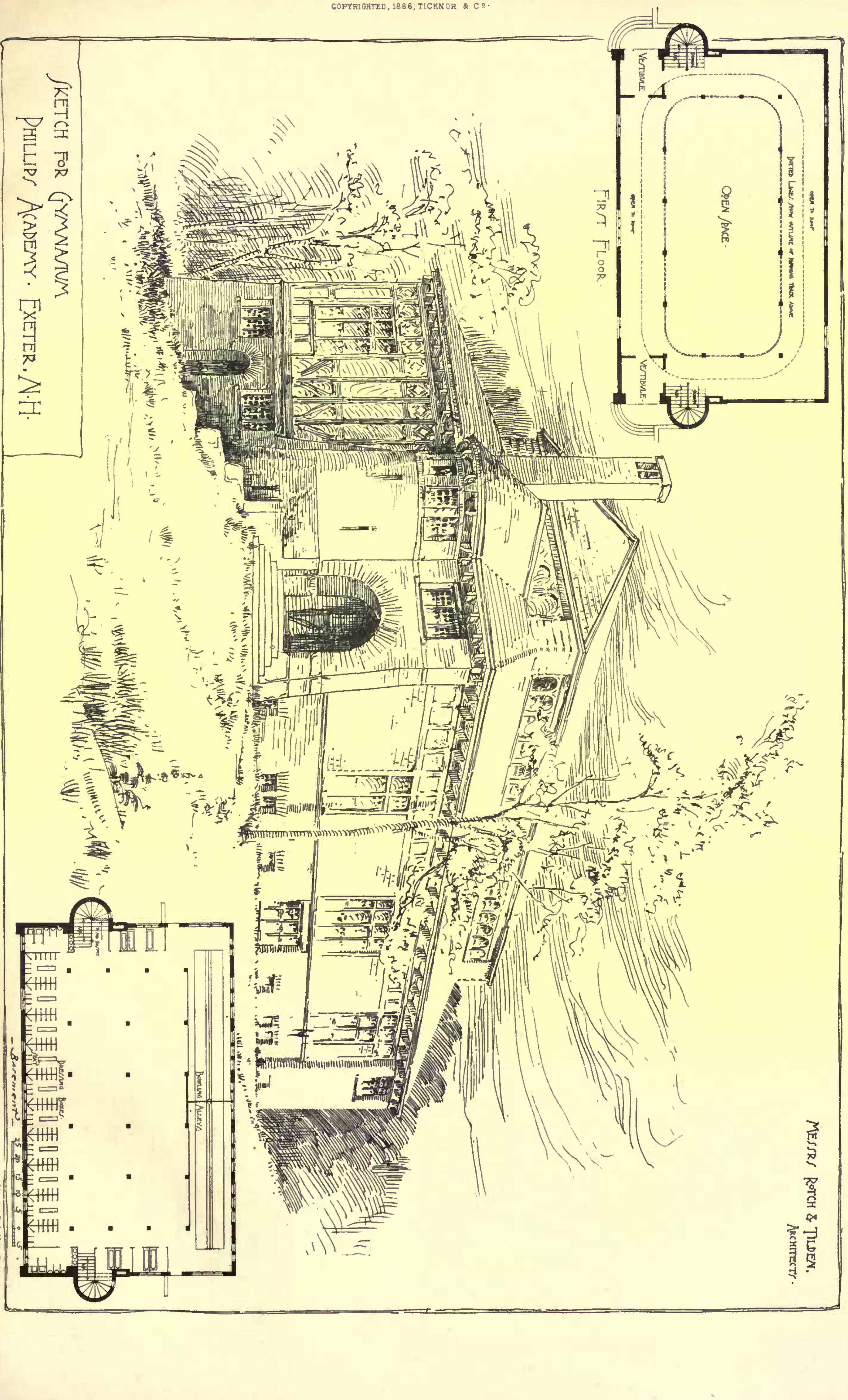
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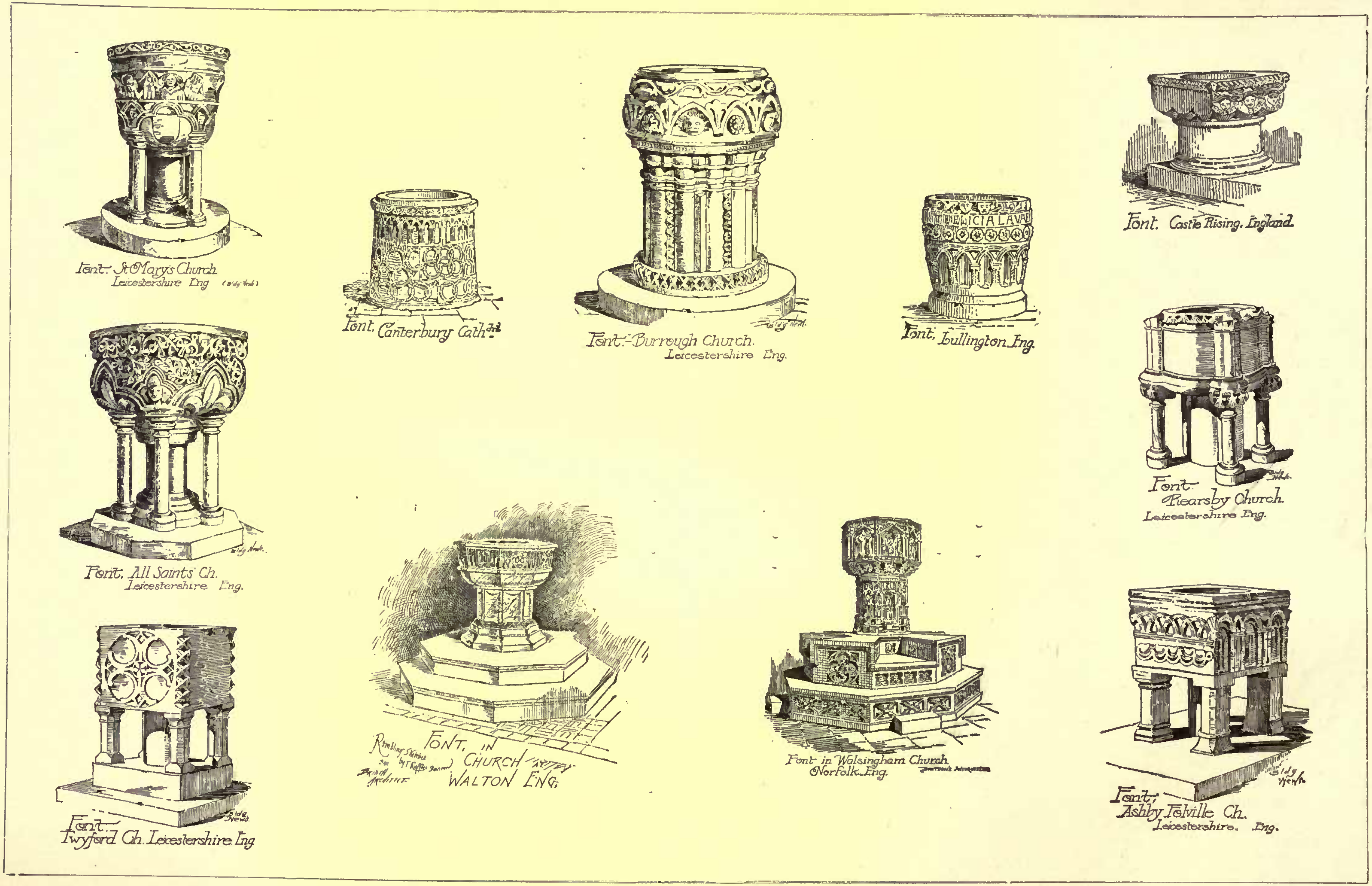
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FONTS.

it should be. I am afraid that the two things are commonly put together nowadays owing to a misunderstanding. I heard the late Cardinal Wiseman give a lecture on the Connection of Science and Art, and if any one could have made a good case as to the supposed connection I am sure the Cardinal could. He set at work, gave a very ingenious and amusing lecture, full of eloquence, such as I wish I could give you. At the end of the lecture I amused myself with thinking "how much real connection between the two subjects has this gentleman shown?" It resolved itself into this. Being a distinguished person in the Church of Rome, and having spent a great deal of time in Rome, he naturally talked about St. Peter's — a triumph of art of a certain kind. What he said was something to this effect: "St. Peter's is a very famous place; its dome is almost the largest in the world, and, taking the height and the width together, it is really the largest in the world. But the dome is cracked, and the people set about to mend it."

That was very shabby language to use about such a place as St. Peter's; but I am in the habit of boiling things down, and seeing what the meaning of a thing is when reduced to its simplest elements. The best case the Cardinal could make out was that the dome of St. Peter's got cracked, and that scientific men set to work to mend it, and mended it by putting a chain around it. That is not the most beautiful style of mending a crack, and it does not seem to say much for science connected with art. It seems rather like a severance; it appears to show that the artistic people who designed the dome had not much science, and it certainly demonstrates that the scientific people had not much art.

I have been thinking about a good many things of the same kind with a view to finding connection between science and art, and could never find any until the other day I read in one of the papers as to these classes that the students painted on china, and that the china was fired and burned afterwards to make the colors fast. This is a combination of science and art, no doubt. The art of painting would not do much in regard to china without the science or art of burning. Art means a good many things. There is the art of making bread, and the art of making clothes. The people who call themselves artists are very numerous indeed. I have had to do a good deal with architects, and always found that for some reason or other, they wish to call themselves artists, though I have never been able to make out why. It seems to me that an architect is not an artist. An artist must do something with his fingers; he does not work with his mind only; an architect does not do anything with his fingers; he merely makes drawings, and tells other people how they are to do the work. A number of people claim the title of artists with much better reason than architects. Painters and sculptors are artists; there is no doubt about them. In modern times singers are called artists in the newspapers; I do not know much about singing, and never go to the opera. Actors are often called artists. Going a little further down, I think I have heard hairdressers called artists. Dressmakers are frequently called artists; and I know, also, that tailors are called artists. So they ought to be, because they produce very excellent results, and I am not sure but that when they have good subjects to work upon — very unlike myself — they produce more successful results than architects generally.

I remember once giving tremendous offence at the Architectural Museum, or some such place, where I was making a speech, by venturing to say that the carvers who executed the ornamental work, such as is now going on at St. Alban's Abbey, were really people almost of as much importance as the architects themselves. Of course the architects glared at me, and some would not speak to me for a week after. Yet, surely, a carver is an artist. The man gets up on a scaffold, and with his few tools chisels out flowers and heads, such as may now be seen by going to the west front of the Abbey. An architect can do nothing of the kind, though he may do what is much greater if he does it well. Art, if it means anything, means the art to do something; it may be a good or a bad thing; by usage it may come to be associated with a beautiful thing, or what people call beautiful. But it is very difficult to say what is beautiful, for there is no canon of beauty that I know of — no rule except following the example of Nature. There is no unquestionable standard of beauty except Nature. Nature never copies herself. There are millions of leaves on trees, but I defy you to find two alike. This is a lesson I have endeavored to impress upon the workmen with whom I have had to do here and elsewhere. They imitate to too great an extent. I urge them not to be too exact, but to use a little freedom, as Nature does and as the old builders did. I have pointed out to workmen over and over again pieces of old work. I have asked them to look at a moulding; examining it, at first the moulding seems to be the same throughout, but close inspection shows that the work varies. The old workmen were really artists, and they did as Nature does. They made both sides of their buildings tolerably alike and symmetrical, just as both legs and arms and the two sides of a man's face are alike. But let any one hold up his two hands and look closely at them and he will find that they are different. The two sides of a person's face are not exactly alike. The same thing applies to the colors of animals. Did you ever find two dogs or tigers colored alike, or with both sides alike? That is the way with Nature; she works by general uniformity and not by exact uniformity. Nature never copies herself. What I have said is the result of observation of Nature, which is the source of all beauty.

What do you mean by Nature? There are philosophers nowadays who are always ready to state that Nature does everything, and that what they call natural selection does everything. Professor Huxley, who is a most advanced philosopher (a gentleman who believes in nothing but matter and himself, as a great man said once), — is too much of a philosopher not to know the true meaning of Nature. He said, "Nature is only the general result of all causes." He might have said, "Nature is the result of all causes and the cause of no result." Nature cannot be talked of as if she were the inventor and creator of all things. Look at what the thing called Nature has done in the way of beauty. Some of you have been reading, no doubt, that the colors of flowers are produced spontaneously, or by the action of bees. That may be true, to a certain extent, but consider to what a small extent it goes. What are bees fondest of? According to my observation in this neighborhood, they are fondest of mignonette flowers and lime-trees. There is a fine tree of that kind in the rectory garden, and I never go there without being struck with the number of bees about the tree. How much color have the bees managed to impart to those two favorites of theirs — mignonette and the lime tree? They are two of the dullest-colored things in nature. According to the philosophy to which I have referred, bees have been at work millions of years making colors, but they have laid none on those two things. I say, therefore, that they have been a very small cause. If bees made the colors of the trees, have they also made them the shape they are? Have they made the beauty of hills and dales and mountains, and all the forms of water and clouds, and ice and snow, and everything of that kind? It is the object of art to imitate Nature in pictures; and in other ways, by having regard to results, and the observation of methods and laws. Take the rainbow, the most beautiful thing in Nature, and the northern lights, or aurora borealis — what has produced them? — the regular laws of Nature. Nature is the result of natural causes — the action of all causes, the action of the Creator, and nothing else. Art is the producing of beautiful results; or perhaps of simply useful results, or perhaps of results which are neither beautiful nor useful.

Next comes science. I began by pointing out that although this is a school of science and art, there is very little connection between the two things. It does not follow, however, that things which ought to be learned need have any necessary connection with each other. There is very little connection between classics and mathematics, yet they ought both to be learned. The real distinction between art and science is that art is uncertain and science is certain — or ought to be certain. A great many people talk about science, and pretend to arrive at certain results, although they are very uncertain in their knowledge. That is not true science. Science is simply a fine word for knowledge, and knowledge is certainty, or such certainty as is to be achieved. You know, no doubt, that Napoleon Bonaparte was beaten at Waterloo, but most of you would find it very difficult to prove it. That may be called the science of history. Until fifty or sixty years ago electricity was hardly known for any practical purpose. There is a great deal of certain knowledge about it in these days, and a great deal of uncertain knowledge, if I may use the phrase — that is, a great deal of positive statement, which is no knowledge at all. Some people think they know what electricity is; but a great philosopher — the greatest philosopher almost of this century — said, in my hearing, "I have not the least idea what it is." That was Faraday; he said he knew the results, but did not pretend to know what electricity is. But it is the fashion nowadays for people to be in such a hurry to know everything — they must be up in the latest theory. They pick up something in the newspapers, and at once talk of it as if it were an accepted truth. They say that there is no doubt that ultimately all force is alike — gravity is heat, heat is electricity, and everything is everything else. Faraday tried to find it out, but he never got a step towards it. That is the difference between sham and real science. Faraday was really a scientific man, and was not afraid to utter that dread phrase — "I don't know." What science could do nobody could say, because science was necessarily progressive. Yet people write of what it is certain can be done and what cannot be done. Philosophers proved that steamboats could not go across the Atlantic, and a great many other things, which a few years afterwards were done every day. When people talk confidentially about science they should not take things for granted; very often they think they know things which they do not know.

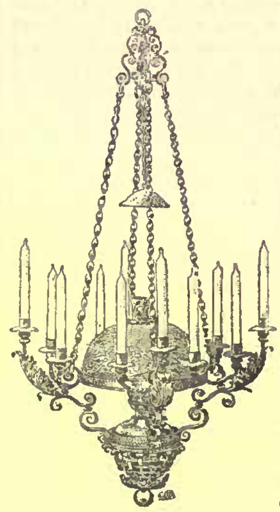
One science is absolutely certain, and only one, — mathematics. There is one infallible rule, and that is the multiplication table. The multiplication table, and the laws of triangles, and things that follow on them, are about the only complete certainties we have. As I have said somewhere else, if a man told me that with dice sixes had been thrown a thousand times running, I should stare at him, and say that the chances against such a thing were millions beyond all calculation; still it might happen. I might tell the person that I very much doubted whether he was not a liar for saying so,—tell him so civilly, of course; but the thing is possible, and therefore I could not positively say he was a liar. But if a man told me that the two sides of a triangle together measured no more than its third side, I should say to that man, "Sir, you are a lunatic. That is only fit for a lunatic asylum. Go there to be believed; don't come and teach it here." So it is with everything connected with mathematics. Linear perspective is mathematics, — there is certainty; and that reminds me that many artists have not the slightest idea about perspective. If a man tells me that his colors are right, I cannot tell him that they are not, not having the knowledge which the artist is supposed to have

on that point; but if a person tells me that a drawing which is manifestly out of perspective is in perspective, I say, "Sir, I know you are wrong. You may just as well tell me that four fours are fifteen." Coming to another part of the list of prizes to be presented, I see that free-hand drawing is taught; that is hardly to be called a certain subject, though a near approach to it, and a valuable study. I cannot say much for the painting on china which is very much talked about at present, — that is "an art." As to chemistry, that is approaching to a certainty, no doubt; but it is only an approximation, and a thing somewhat given to change.

I am sorry to say that I must after all end as I began. I am going to parody a saying of Sydney Smith. He was invited by a nobleman who was not celebrated for hospitality to go and see his house and pictures; he accepted the invitation, and on going to the house was treated with a shabby luncheon. He, however, was shown a lot of fine pictures in gilded frames. When he was about to leave, the host said to him, "Well, I hope you liked it." He replied, "Oh, yes, it is all very fine; but I would rather have seen more *carving* and less gilding." So I would rather have seen more science and less art. We must, however, take things as we find them. It is better to do art than nothing, though I have not a high opinion of it, from its uncertainty and other qualities which I will not recite again. In a letter to me your secretary stated that the art of building is taught in this school. I am very glad to hear it; it is an art that very much wants teaching. A great many errors have crept into it. There is one error with regard to the old builders which I should like to correct. It is said that the builders of old times knew a great deal of science and art. Of art they did know something, but of science little. Art, somehow or other, does not accompany and go along with civilization, as one might expect. It seems somehow to get squashed by civilization. People nowadays are infinitely above savages in knowledge, yet they lack notions of art which some savages possess. Ever so long ago, when I was at college, some weapons made by South Sea Islanders out of stones and sticks used to be shown. When they were examined, the handles of the weapons were found to be decorated rather nicely. In Indian art the work in silver and brass is very beautiful,—beautiful in shape, beautiful in ornamentation, and following Nature in not being too uniform. Take the statuary of Greece, the most famous in the world; they had very little science in those days, nor indeed in the Roman days. At the time the best English buildings were done, down to the fourteenth century, when the work manifestly began to deteriorate, there was hardly any science. People think there must have been a tremendous lot of science among the old builders, because they constructed those high towers, stone vaults, and other things of the kind. But I have been behind the scenes, and found that a great deal of that work was done very badly indeed. It is true that they had science enough to make their buildings stand for a number of years, but they were bad builders,—did not know how to make their mortar or how to select their stone. They designed contrary to all rules of mathematics and of mechanics; their buildings began to split and almost to fall down from time to time. St. Alban's Abbey has been a succession of ruins and repairs from the earliest times until now. The state of a great deal of it has been before your eyes in the last three or four years. Therefore you should not run away with the idea that the old builders, by some sort of inspiration or magic, possessed science and art. John de Cellâ [Abbot of St. Alban's from 1195 to 1214] was a bad architect; he did not know how to build and make his work stand, or what sort of mortar he should use. He knew nothing of those things, though he was a good artist as far as mere beauty went. If you have classes for the art of building, I hope the students will be taught how to make mortar, how to make proper abutments for arches to stand against, not allowing large arches to rest against nine-inch walls, as was done in the case of the Abbey. Two or three architects wanted to do the same thing again, and more than two or three,—the whole Institute of Architects,—wanted to do it, and if they had n't had such an obstinate customer as I was to deal with, they would have succeeded. I like walls like myself. When John de Cellâ had a wall nine inches thich, over which he put a great arch and window, I put nine feet. I do not wish to impose my figures on everybody, but what I have done was the result of mathematical teaching. If any of you are going to begin building begin at the bottom, with a mathematical knowledge of mechanics. Mothers, with sons who can draw "pretty things," put them into architects' offices, there to develop their admirable tastes. A young man of this sort is set to work to copy his master's specifications and drawings; he does that over and over again; the parents pay the architect £300 or £400; afterwards the young gentleman takes an office, and is an architect; and that I am not. — *Builder.*

LIGHTNING AND IRON.— Mention was made in the Academy of Sciences, Paris, of a house in Neufchatel which had been struck by lightning, and some one suggested that some old iron stored in the attic had attracted the electric fluid. M. Colladon immediately scouted any such idea. He said the iron had nothing to do with attracting the lightning, but had probably been a cause of the burning of the building after it had been struck. The explanation of this is that a combustible substance placed between two conducting surfaces — in this case the humid atmosphere and the pile of iron — is generally sure to take fire when an electric current is passed through it from one conducting surface to the other. The lightning having struck the house, it found its way to the metal within and ignited whatever combustible material it found. — *Philadelphia Telegraph.*

DILATANCY.



Chandelier, Mr. W. T. Wilson's House. Messrs. J. A. & W. T. Wilson, Architects. Baltimore, Md.

TO Professor Osborne Reynolds is due the credit of making a discovery which promises to be of some importance. The discovery appears to have resulted from experiment, guided as much by inductive reasoning as pure curiosity. It is, says the *Engineer*, a remarkable discovery, in that it was quite unanticipated, and is, indeed, apparently opposed to past experience. Of course, it is not really opposed, for Nature does not contradict herself; but the precise conditions necessary have never before been secured properly by a philosopher, though no doubt they have been present scores of times when the philosopher was absent. The discovery, referred to at the last meeting of the British Association, was more fully described at the weekly evening meeting of the Royal Institution on the 12th of February. A special word has had to be coined for dealing with the discovery, which word we have used at the head of this article. The title of Professor Reynolds's paper given at length is "Experiments showing Dilatancy, a Property of Granular Material, possibly connected with Gravitation."

If we ask any of our readers what will occur if an India-rubber bag containing sand and water, and communicating with a bucket of water by means of a tube, be pressed between two flat boards, the answer will be that the water in the bag will be squeezed out into the bucket. Broadly stated, Professor Reynolds's discovery is that this is not what will happen, but that, on the contrary, water will at once rise up the pipe from the bucket, and enter the bag. Paradoxical as it may seem, the bag becomes larger, up to a certain limit, the more it is squeezed. Professor Reynolds began his discourse by telling his hearers something about the mysterious ether by which light is transmitted to us from the sun, by shearing which in two, according to Dr. Lodge, we get electricity; the possible cause of cohesion and gravitation; an elastic, homogeneous jelly pervading all space, more rigid, in one sense, a million times, than cast steel, and yet so tenuous that it does not sensibly retard the motion of planets moving through it. Whenever a phenomenon presents itself which cannot be otherwise explained, it is referred to the ether, and there are nearly as many ethers as there are philosophers. It has been said, indeed, that no less than six different ethers are needed to satisfy the predicates of the vibratory theory of light. Maxwell found no comfort in the ethers; on the contrary, he maintained that they were like the glasses of the dram-drinker — one always led to another, necessary to explain the existence of the first. "As the result," says Professor Reynolds, "of a long-continued effort to conceive a mechanical system possessing the properties assigned by Maxwell, and, further, which would account for the cohesion of the molecules of matter, it became apparent that the simplest conceivable medium —a mass of rigid granules in contact with each other—would answer, not one, but all the known requirements, provided the shape and mutual fit of the grains were such that, while the grains rigidly preserved their shape, the medium should possess the apparently paradoxical or anti-sponge property of swelling in bulk as its shape was altered."

No one ever dreamed that the cubic content of sand in a sack was affected by the shape given to the sack. Yet now that we are told all about it, we wonder that we did not see the truth before. If the grains interlock, their alteration of form must, under given conditions, augment the space occupied. For example, if we shake or disturb a brick wall, it is evident that we increase its dimensions, because the bricks are no longer so close to each other as they were. In an ordinary mass of brickwork or masonry well bonded without mortar, the blocks fit so as to have no interstices; but if the pile be in any way distorted, interstices appear, which shows that the space occupied by the entire mass has increased, as was shown by a model. At first it appeared that there must be something special and systematic, as in the brick wall, in the fit of the grains together, but subsequent consideration revealed the striking fact that "a medium composed of grains of any possible shape possessed this property of dilatancy so long as either of two important conditions was satisfied." The conditions are that the medium should be continuous, infinite in extent, or that the grains at the boundary should be so held as to prevent a rearrangement commencing. All that is wanted is a mass of hard, smooth grains, each grain being held by the adjacent grains, and the grains in the outside prevented from rearrangement.

Professor Reynolds obtained the necessary conditions by using a thin India-rubber bag holding six pints. This bag, being filled with clean dry sand, such as is used for hour-glasses, served for many experiments. The bag was coupled to one leg of a mercury pressure gauge, and it was only necessary to flatten the bag to make the mercury rise seven inches in the leg next the bag; in other words, a partial vacuum was established by squeezing the bag. The reader will naturally ask what would take place if no air found its way into the bag by the way of the mercury. In that case, the resistance to

squeezing would be much increased, and when water is used, which is non-elastic, the shape of the bag cannot be altered at all.

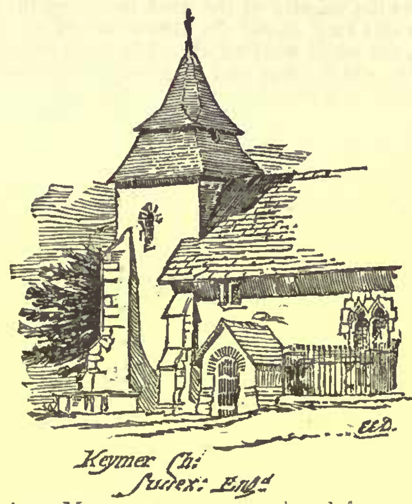
"Taking," says Professor Reynolds, "the same bag, the sand being at its closest order, closing the neck so that it cannot draw more water, a severe pinch is put on the bag, but it does not change its shape at all. The shape cannot alter without enlarging the interstices; these cannot enlarge without drawing more water, and this is prevented. To show that there is an effort to enlarge going on, it is only necessary to open a communication with a pressure gauge, as in the experiment with air. The mercury rises on the side of the bag, showing when the pinch is hardest—about two hundred pounds on the planes—that the pressure in the bag is less by twenty-seven inches of mercury than the pressure of the atmosphere; a little more squeezing, and there is a vacuum in the bag. Without a knowledge of the property of dilatancy, such a method of producing a vacuum would sound somewhat paradoxical. Opening the neck to allow the entrance of water, the bag at once yields to a slight pressure, changing shape, but this change at once stops when the supply is cut off, preventing further dilation."

Professor Reynolds has as yet drawn few deductions. He prefers to continue his experimental researches, and some of the results are very curious. "Putting a bag filled with sand and water between two vertical plates, and slightly shaking while squeezing, so as to keep the sand at its densest, while it still has a free surface, it can be pressed out until it is a broad, flat plate. It is still soft as long as it is squeezed, but the moment the pressure is removed, the elasticity of the bag tends to draw it back to its rounded form, changing its shape, enlarging the interstices, and absorbing the excess of water; this is soon gone, and the bag remains a flat cake, with peculiar properties. To pressures on its sides it at once yields, such pressures having nothing to overcome but the elasticity of the bag, for change of shape in that direction causes the sand to contract. To radial pressures on its rim, however, it is perfectly rigid, as such pressures tend further to dilate the sand; when placed on its edge, it bears one hundredweight without flinching. If, however, while supporting the weight it is pressed sufficiently on the sides, all strength vanishes and it is again a rounded bag of loose sand and water." By shaking the bag into a mould, it can be made to take any shape; then, by drawing off the excess of water and closing the bag, the sand becomes perfectly rigid, and will not change its shape unless the envelope be torn; no amount of shaking will effect a change. In this way bricks can be made of sand or fine shot full of water, and the thinnest India-rubber envelope, which will stand as much pressure as ordinary bricks without change of shape; also permanent casts of figures may be taken. When we walk along a wet beach, around each foot-print the sand is seen to change color for some distance. This is because the pressure of the foot has changed the shape of the mass under it, and the water is sucked in, drying the sand all around. It seems a paradox that instead of squeezing the water *out* of that portion of beach rigid under foot, it is sucked in.

Although Professor Reynolds has not drawn deductions, we cannot resist calling attention to one or two which suggest themselves. May we not find here the cause of rigidity? The bag of sand is stable, because to change its form would augment its bulk. May not a bar of steel be stable for the same reason? Our readers will not be slow, we think, to see that Professor Reynolds has left a good deal to be explained. For example, to state that a cake of sand and water is stable because a change of form would augment its dimensions, is only to reason in a circle. We naturally ask, "Well, why should it not increase its dimensions? and to this Professor Reynolds supplies no answer. It is true that an increase in volume would lead to the production of a partial vacuum inside, and that in so far the pressure of the air outside would tend to promote stability; but this stability ought to be elastic or dynamic stability, not static. Concerning this, no doubt Professor Reynolds will have more to say. The apparatus required is extremely inexpensive, and there is no reason why a whole army of workers should not attack this subject with excellent results. Meanwhile we may say that it has long been known to engineers that sand, unlike water, exerts under suitable conditions no lateral pressure. For example, bags of dry sand have been employed instead of wedges to carry the centering of bridges. The loads may be very heavy, yet these canvas bags will not burst. If the sand behaved like a liquid, they would be rent in a moment by a hundredth part of the load. To strike the centres it is only necessary to open a small hole in a bag, and let as much or as little sand run out as may be needed. A paper plug will suffice to stop the flow.—*Scientific American.*

REMOVING OBSTRUCTIONS FROM PNEUMATIC TUBES.—The method pursued in removing obstructions from the pneumatic tubes in Paris is that of simply firing a pistol into the tube. The resulting wave of compressed air, traversing the tube at the rate of 1,000 feet a second, strikes the impediment, and is then deflected back to its origin, where it strikes against a delicate diaphragm, its arrival being recorded electrically upon a very sensitive chronograph, on which, also, the instant of firing the pistol has been recorded previously. The wave of sound, on reaching the diaphragm, is recorded, and thence reflected back, a second time striking the obstacle, and returning to the diaphragm. The operation being several times repeated, several successive measurements are thus made of the time required by the sound wave to and fro within the pneumatic tube. Other means have been resorted to for the accomplishment of the purpose in question, but none has proved equal to this.—*Philadelphia Telegraph.*

WINDMILLS FOR WATER-SUPPLY.



IN one of its summer cartoons, *Puck* pictures a large group of artists in grotesque positions sketching one and the same windmill, and thus conveys pleasantly and strikingly its point that there are dozens of artists to do more or less justice to each windmill in the country. Possibly if we have in mind the old-fashioned windmill of the Dutch type which *Puck* portrays, this may literally be the case, but we scarcely imagine that the proportion will hold true, when the distinctively American type of windmill is considered, for of these there are hundreds of thousands in use in America. Most of them are employed for pumping water, and exceed in economy for this purpose any other motor in the market. We are well aware that these statements will be surprising to many, but they are none the less true on that account. Furthermore, despite an erroneous popular notion that windmills are antiquated, their use is constantly increasing, so that there are single cities in the Union in which thousands are manufactured each year.

It would be interesting to trace the early history of windmills, beginning with the twelfth century, which period authentic record fixes as the date of their original use, and show their development unto the present time, when the American type has almost replaced the far more picturesque but much less efficient Dutch mill. But our object being one of practical import, to point out briefly the construction and the economy of the American windmill for water-supply, we must sacrifice the interesting for what, it is hoped, will prove the useful.

Let us then mention among the main adaptations of their use, the supply of country houses and farms, of manufacturing establishments, and of the upper stories of office-buildings and domestic dwellings, when the pressure in the reservoir is not sufficient to effect this, the supply of railway water stations and tanks, and the irrigation of lands. Experience has proved that for eight hours per day the windmill will work up to its rated capacity, and if provision is made to have sufficient tank capacity for a three days' water supply, there need be no anxiety of the water giving out, for a calm of two days' duration may be said to be the outside limit in the United States. The average velocity of the wind in this country, during the eight hours of running, is about sixteen miles per hour, corresponding to a pressure of 1.2 pounds per square foot of surface.

The receiving surface of the American windmill and the methods employed to regulate the extent offered to the wind, as its force varies, are the distinguishing features of the American type. The transmitting parts are the ordinary crank-wheel and connecting-rod, and similar methods of transferring circular into rectilinear motion.

The receiving surface or "wind-wheel" is made up of a large number of blades or slats of small width, set at an angle into cross bars connecting the arms of the windmill. This construction gives a distinct appearance to the American wheel, since it resembles a closed surface as compared to the large open spaces between the arms of the Dutch mill, though of course ample room is provided between the slats to permit the free escape of the impinging air. This division of the receiving surface of the mill into a large number of narrow sections, which in turn are sustained by truss rods from an extension of the main shaft, enables a much smaller aggregate weight of parts for a desired strength, size and capacity of mill; so that the American windmill is lighter than the Dutch. The angles employed are not as advantageous in the former as in the latter; but the surface presented for a given diameter is so much greater in the American wheel as to more than compensate for this defect.

No better proof of the superiority of the American windmill need be given than the fact that it is rapidly replacing the Dutch type in Germany, France and England, and that it is being manufactured on a large scale in these countries. In the English colonies, too, the American windmill is being extensively used, on the recommendation of English engineers.

The two principal types may be distinguished respectively as the sectional wheel with the centrifugal governor and independent rudder, and the solid wheel with the side-vane governor and independent rudder. In both types the rudder brings the wheel into the direction of the wind. This rudder is a large strong vane projecting opposite the shaft and the wheel. The plane of the rudder is vertical and perpendicular to that of the wheel; so that the wind, however shifting, acts directly upon the rudder to bring the plane of the wheel normal to the wind.

In the first type the flying out or receding of weighted arms causes the slats of the wheel to revolve, in sections, on pivots in the windmill arms or frame, thus bringing the slats or the surface of the wheel more or less normally to the direction of the wind.

In the second type there is a vane nearly in the plane of, and directly behind the solid mill-wheel, which vane is attached to the bearing of the shaft. When the velocity of the wind increases, the increased pressure on this side vane causes the wind-wheel to turn bodily away from the wind, the whole wind-wheel and bearing rotating on a horizontal turn-table, which forms part of the support of the mill. Thus, less effective surface is presented to the wind until the wind decreases, when the lowering of a counter-balancing weighted lever, raised previously by the turning of the wheel when the pressure was high, causes the wheel, together with its accompanying side vane, to turn more normally to the wind.

In a third type a solid wind-wheel is employed, but the regulation is effected by placing the rudder or its equivalent at a slight angle to the centre line of the shaft, so that the wind-wheel is never entirely normal to the direction of the wind. As the wind-pressure increases materially, the rudder is thrown more to the side, and the wheel more out of the wind. In a fourth type no rudder at all is employed, and the pressure of the wind on the wheel itself is relied upon to bring the wheel into the proper direction. These latter two types are not at all sensitive, but answer satisfactorily for smaller mills, to which their use is restricted.

The two leading types of American windmills, manufactured in regular sizes from eight and one-half feet to forty feet diameter of wheel, act with sufficient accuracy and promptness to place them in the rank of reliable automatic engines. But even conceding this, it must be shown that they are more economical than other motors employed for pumping water, if the windmill is to be used in preference. Such, however, is the case. That motor may be defined to be the most economical which develops the desired pumping effect for the least current money expense, including in such expense the sum of the interest, repairs and depreciation of motive plant, cost of fuel, attendance and the like.

Judged on this basis, and mainly because wind is a free gift of Nature, while other motors require fuel, it is found that the windmill is by far the most economical for pumping water in moderate quantities.—*Sanitary Plumber.*

NEW YORK BUILDING NOTES.

THE apprehension of trouble in the building trades has so unsettled the business of contractors and builders that architects complain not only of the scarcity of people willing to invest their money in enterprises the outcome of which cannot be foreseen, but also of the difficulty in getting reasonable estimates from responsible bidders. A well-known architect, speaking about the matter to a reporter of the *Evening Post,* said to-day: "Six months ago it looked as if the New York architects would be overwhelmed with work for the next year to come; as if by common consent investors had turned from Wall Street, and were putting their money into real estate. Every man with a dozen lots in the up-town districts wanted to put up at least one house in order to help along the property, and the noise of the steam drill was incessant in neighborhoods where excavations had to be made in rock. There was apparently no end of work ahead for every one connected with the building trades, and wages were excellent. Then the agitators of the labor unions began their work and unsettled confidence so completely that instead of a year of plenty, we are likely to have a year of famine. The workmen could not have gone to work more surely to destroy their chances of steady work at fair wages. You can estimate that it will cost at least ten per cent more to build a house now than six months ago. Labor costs about that much more, and the uncertainty as to what workmen are going to ask makes contractors' bids high enough to afford a liberal margin of safety.

"On some country work we cannot get estimates, our usual contractors figuring so high as to make their bids out of the question. We have had two sets of plans in our office for the last two months, upon which contractors refuse to figure at all until they know what their men are going to do. For all they know they may have to shut up their shops when the job is half done. The only way out of the trouble for the present is for owners to share the risk by agreeing to bear part of the increase in wages, if there should be any, and to hold the contractor free from blame in case of delays caused by strikes. But of course very few people are willing to build at all under such circumstances, and I doubt if one-half of the buildings for which permits have been obtained from the Building Bureau during the last six months are begun at all this year. The business has been pretty well killed by the men who will suffer most by the collapse. If the labor unions are alive to their own interests, they will make haste to guarantee that wages and hours of labor will remain as they are for at least a year. After the buildings now under way are finished there will be a period of stagnation for which the suffering workmen will have to thank their leaders."—*N. Y. Evening Post.*

Contributions Misappropriated.— A *London Times* correspondent at Malaga asserts that the large sum of money contributed in England for the relief of the sufferers by earthquakes in Spain has been diverted to the restoration and reconstruction of churches, convents, and other religious establishments. It was placed in the hands of the Archbishops, and none of it has reached the destitute and suffering people for whom it was intended. Indeed, they have been kept in entire ignorance of the existence of the charity.

SOCIETIES

H. H. RICHARDSON.

The Architectural League of New York has entered the following in their records and for publication: —

In the death of Henry Hobson Richardson we sorrowfully realize that one of the greatest architects of his time has passed away.

His works already executed are sufficient proofs of his greatness, and are monuments to his commanding genius.

We deeply regret that a brilliant career, whose magnificent opportunities had only fairly begun, should be cut off so suddenly; and at the same time we recognize with gratitude the benefit which the cause of good architecture has received at his hands. His influence and the inspiration derived from his work are productive forces which it is not too much to say may result in the formation of a national style.

Already his success in adapting to modern wants the noble style in which he worked has encouraged many eminent architects to follow in his footsteps, and to-day his influence can be traced throughout the country wherever architecture is logical and has vitality.

His indomitable energy and great personal qualities, coupled with unusual artistic gifts and vigorous originality, produced the great results of his comparatively short career.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

THE UNDERWRITERS ON SAFE BUILDING.

Boston, Mass., May 4, 1886.

To the Editors of the American Architect: —

Dear Sirs, — I have read with much interest the notice and criticisms on the circulars recently sent out by the Boston Board of Fire Underwriters, which appeared in your issue of the 24th ult.

I sincerely trust that this is only the first step toward bringing the views of architect and underwriter more nearly together as to what should constitute the best form of structure; or, in other words, *how to get the greatest possible amount of practical utility out of a given expenditure of money, both for the owner of the building and the community at large.*

The circular entitled "Slowly Combustible Buildings" was somewhat hurriedly prepared, and with more careful study could, undoubtedly, be considerably improved if rewritten. Its primary object, when first issued, was to inform the community at large, and especially those about erecting new buildings how they could, by adopting a better form of construction, put up a building that should be practically fire-proof without any very great increase in the expense of construction. It was an attempt to formulate the rules of "Mill Construction," now so universally insisted upon by all our great New England Mill Mutual Insurance Companies, and to which, with their rigid quarterly inspections, and the introduction of suitable appliances for the extinguishment of fire, they attribute nearly the whole of their phenomenal success in keeping down the ratio of fire loss on property covered by them, as shown by the following table of statistics, viz.: —

YEAR.	Risks Written.	Premiums Received.	Losses Paid.	Expenses.	Ratio per cent.	
					Losses to Prems.	Exp. to Prems.
1870......	$92,948,470	$908,593	—	—	—	—
1875......	178,581,474	1,639,062	$280,248	$145,614	17.0	8.8
1880......	241,848,617	2,126,290	533,039	195,000	25.0	9.1
1885......	406,869,636	3,494,907	502,071	256,655	14.3	7.3

Could anything like this small ratio of loss on the miscellaneous mercantile and manufacturing property covered by our stock insurance companies be obtained, it would be a saving to the people of this country and Canada of considerably more than fifty millions dollars annually; what higher incentive can our architects, as a body, have than to strive to save a large portion of this needless annual waste and loss? Perhaps the best way to accomplish this result would be to have a free interchange of views with the underwriters, who are constantly giving this subject their most earnest attention. By this means, both architect and underwriter could become better informed on the principles which underlie their respective professions, and each could then cordially labor to advance the interests of both. The rigid inspections and the appliances for the extinguishing of fire, made use of by the mill mutuals, can be introduced at any time; but a rapidly combustible building, once erected, can only be altered into a slowly combustible one at very great expense.

Regarding the substantiality of the criticisms made on the circular entitled, "Slowly Combustible Buildings," I can only say that we already have nearly completed several large warehouses here in Boston, built in accordance with the instructions of this circular; and I

have yet to hear of architect or builder meeting with any difficulties while complying with their requirements. These warehouses also have another most excellent feature, adopted at our suggestion, although not referred to in the circular; and that is, the floors are placed at an incline of one-eighth of an inch to the foot, so that with proper iron scupper holes placed in the external walls, all water thrown into a given story for the extinguishment of fire will quickly run out of the building without doing any possible damage by water to goods on the floors below.

The Boston Board of Fire Underwriters has always made an additional charge for height in excess of sixty feet, on buildings constructed in the usual manner, on account of the difficulty of forcing water above that height with the steam fire-engines now in common use. It may well be worthy of the underwriters' careful consideration, in view of the nearly fire-proof construction of each story independent of those above and below, whether this fact should not be a satisfactory reason for placing the limit of height on this class of buildings, without extra charge, at seventy or seventy-five feet, instead of sixty feet.

I agree with the critic that a flooring of plank, "grooved and splined" is equally as good as one "tongued and grooved," and probably a trifle more economical in its construction. When I said "tongued and grooved," I did not intend to exclude the "grooved and splined;" and it was an oversight on my part not to have included both in the circular.

I do not think the criticism on the exclusion of sheathing and plastering under floorings is quite so conclusive. If the owner wishes a neater finish, and does not mind the additional expense, we certainly shall not object to the wire lath and plaster, if properly put on, closely following the outlines of the timbers and floors; but I endeavored to give instructions for the erection of a building *without any unnecessary increase in the expense of construction*, and this insertion of sheathing or plastering would necessarily cause some increase for labor and material used. In place of the sheathing, a much simpler and more inexpensive way would be as follows, viz.: When the plank is run through the mill for grooving, a second knife can be placed on the moulder in such a way as to cut a second rabbit, three-eighths of an inch in depth and width at each of the lower corners of the plank; and then, after the plank has been placed in position, a small half-round, three-quarter inch bead can be placed in these grooves, and secured in place by nailing to the plank on one side of the joint only; if the plank is wide, a centre bead can be run to give the plank more nearly the appearance of sheathing.

I understand that mortar has ceased to be used for deafening purposes between the floorings of cotton and woollen mills; but it was not on account of the dust arising from its disintegration, as it has been found perfectly solid years after it was placed in position. The floors of many of our best buildings in the "Burnt District," of Boston, are protected in this way, and I have yet to hear of a single instance where trouble of any kind has arisen from its use.

Iron columns if properly filled and backed with brick and mortar, may answer very well for the support of exterior walls, although we much prefer the plain brick wall. If the hollow iron columns used for interior support were cast in an upright position (as cannon are) we should obtain a much more reliable article than in the present method of horizontal casting; as, in the latter method, the core is almost always more or less to one side of the centre, making the shell of the column thick on one side and thin on the other. Indeed, it is no uncommon thing for builders to find (when they take the trouble to test the iron columns they are about using) that, with a light hammer, they can break through the iron shell, on the thin side of the column for its whole length. It was undoubtedly a defective column of this kind that caused the Pemberton Mill disaster of some twenty-five years ago, when so many hundred operatives were killed, or maimed for life. With the giving way of one column, the others, one after another, received a greater strain than they could bear, and the whole came down a mass of ruin. A coating of wire lath and plaster would not prevent a similar disaster under similar circumstances. At the time of the fire in Colt's Armory, at Hartford, some years ago, the floors were supported by iron columns; and yet, while the heat and smoke from the fire were so trifling that men were at work in the room trying to extinguish the flames, the columns began to cripple and fall. Wooden columns would not have yielded in this way. If iron columns must be used to obtain the requisite strength, let them by all means be carefully inspected and properly protected with non-combustible and non-heat-conducting material.

I think my critic is hardly fair in his statement that a five-story warehouse, having cross-beams twenty-two feet long, and capable of sustaining a weight of two hundred and fifty pounds to the square foot on each floor, would require wooden columns twelve inches square, with only twenty-eight inches in the clear between them on the two lower floors; for he could, by doing what any sensible architect would do in such cases, substitute wooden columns twenty inches square, and have them ten feet apart on centres, and still obtain all needed strength in his supporting columns, with ample room for passing between them. And these columns could be burned and charred until they were less than nine inches square, before they would give way under the superincumbent weight, consisting of two hundred and fifty pounds loading, and twenty-five pounds of floor timbers and planking to each square foot of floor area, as shown by reliable tests of this kind of timber at the Watertown Arsenal.

The underwriters stand ready to join hands with the architects, and do what they can to improve the fire-resisting qualities of buildings; and, when convinced of their errors in any respect, to discard them, and accept sounder views from architects, or any other reliable source. With this end in view, they would welcome a free interchange of views; so that wherever improvement in this direction can be made, it may be adopted regardless of the source from whence it comes. Yours truly, JOHN E. WHITNEY,

Surveyor for the Boston Board of Fire Underwriters.

[THIS is the sort of talk we like to hear from underwriters. Our idea, however, is that the underwriters would do better to "join hands" with the owners in promoting good construction than with the architects. There is seldom any disposition on the part of the latter to resist the wishes of their clients in the way of providing solid and secure construction, and whatever the owners will call for, the architects may be relied upon to provide. In regard to our criticisms on the Tariff Association rules, we need hardly say that we only wished to open the way for discussion, and do not know that it is necessary to say anything more. We will, however, venture the remark that Mr. Whitney, in the present letter, scarcely does justice to the manufacturers of iron columns. Some of these, undoubtedly, are cast flat, and are greatly injured by the floating of the core, but most architects know enough to specify that their columns shall be cast upright, and to look out that the traces of the iron bars which have held the core in position show no sign of displacement; while the law in Boston and New York requires that every column shall be drilled in two or more places, before setting in the building, so that the inspector can see for himself if the metal is evenly distributed. With columns such as architects specify, and the laws require, wrapped with wire-cloth and plastered, or protected with terra-cotta or wood blocks, the girders of a heavy building can be held up just as safely as with wooden posts, and far more conveniently. We ought also to caution our readers against relying too much upon Mr. Whitney's plan, which is by no means new, of inclining his floors, and putting in scuppers to let the water run off, in case a fire should render it necessary to deluge them with water. For a year or so after laying the floors, they might be tight enough to hold water pretty well, but after five or six years' use, particularly in buildings with overhead heating, they would leak most copiously, and with a fall of one-eighth of an inch in a foot very little of the water falling on them would reach the scuppers. If any one wishes to accomplish this result in the way that it should be done, let him lay his plank floor, and then put on a regular felt and tar roofing, with nothing but the gravel left out, and lay a matched upper boarding in the hot tar. This will give a floor which will be permanently water-proof enough for the purpose. — EDS. AMERICAN ARCHITECT.]

SPECIFYING PROPRIETARY MATERIALS.

May 11, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,—We desire the opinion of your reliable journal upon a subject of much importance, not only to the architect and his client, but also to the inventor or firm introducing the best article of its class or kind in the market.

An architect who stands high in his profession, and whose integrity is unquestioned, remarks to us as follows: "I admit that your article is the best in the market, and that it has all the advantages you claim for it; but by specifying same in preference to others of its class, I help to create a monopoly, which is not only unjust to my client, but to your competitors as well, as it forces my client to pay you an advanced price for same."

Another architect contends that in specifying the article in question he is "creating a monopoly, and at the same time placing himself in such a position that he may be accused of taking a commission for so specifying."

Is, or is not, the architect (whose client desires the best material in the market) in duty bound to his client—as well as to himself—to specify the article if he is satisfied of its superior quality, and the firm offering said article is known as one that can be relied upon?

Again, is it not the duty of the architect (even should he decide that the article is the best in the market), before specifying the same, to thoroughly satisfy himself as to the reliability of the firm offering the material in question?

We claim that a guarantee, to be effectual, must come from a house of undoubted reputation; and we also claim that there is no prominent building erected to-day upon which, or in which, some special material cannot be found, such material having been specified by the architect for the simple reason that it was the best that skill and ability could produce. If this were not so, for what purpose is the Patent Office in Washington?

We do not doubt that the architects quoted above — although entirely conscientious in their views — have constantly specified and used the particular articles in their buildings, which they nevertheless often view in the light of monopolies.

Yours very truly, OBSERVER.

[THIS is an old question. That an architect is apt to incur criticism, if he specifies a particular manufacture, is shown very conspicuously in the history of the Supervising Architects' Office at Washington, and most architects feel that they ought to be quite sure of the superiority of a given article to warrant them in excluding all others.—EDS. AMERICAN ARCHITECT.]

THE TRIALS OF AN INCAUTIOUS COMPETITOR.

GALVESTON, TEX., May 6, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs,—A short time since the city advertised for plans for an engine-house, and referred us to the Chief of the Fire Department for further particulars. He told us that the city wanted a house of a certain size, to cost a certain amount, and as this amount was quite small it would have necessitated a poorly-constructed frame building,

so I made farther inquiries, and concluded to draw plans for a brick building which, as I estimated, would have cost just $1,000 more. There were two or three other sets of plans presented, but all for frame buildings and these also overran the cost, so I understand; but at any rate, the committee finally resolved to build of brick, and allowed one of the competing architects to put in another set of plans after the time advertised without giving the rest of us any notice. Now then, leaving out right or wrong, can I recover damage, and to what extent, if they build brick without using my plans?

Respectfully, A Subscriber.

[It is very doubtful if any satisfaction could be obtained. The whole affair seems to have been informal, and although the city authorities seem to have violated their own conditions, our correspondent appears to have also done so, and would have no right to claim damages because the other party to the agreement had followed his example. — Eds. American Architect.]

FORFEITURE FOR DELAY.

New York, May 12, 1886.

To the Editors of the American Architect: —

Dear Sirs, — In reference to the communication in your paper of May 1, on the "Responsibility for Dilatory Work," I should like to say that it seems to me that the time for completing a building stated in the agreement is an approximated time, judging from experience with former work; for it would be difficult to prophesy within a week or two as to exact time for finishing a contract. Then again owners sometimes say "make the time short as it will tend to hurry the builder." Many builders will not sign a contract with a forfeit, and I have found them to be among the most respected men in their trades, as they say it frequently leads to a lawsuit. The agreements always provide for putting other men on the work, if there is obvious neglect to proceed on the contractor's part. Can you suggest a wording of the agreement to meet the difficulty?

Respectfully yours, S.

[We think that the best way is to write the forfeiture clause in the contract in some such way as this: "If the said party of the second part shall fail to complete the said works, including all variations should such be made, at or before the time agreed upon, with such extension if any in the case of extra work as may have been made and certified by the said architect, then and in that case the said party of the second part shall forfeit and pay to the said party of the first part as liquidated and ascertained damage the sum of —— dollars for each and every day that the said works shall remain unfinished after such time, *unless in the opinion of the said architect the delay shall have been due to causes which could not have been reasonably foreseen by the party of the second part, or with reasonable care and diligence avoided.*" We have never yet known a contractor to refuse to sign an agreement worded in this way, although, as "S." says, many of the best ones will not sign any contract containing a forfeiture clause in the usual form.—Eds. American Architect.]

NOTES AND CLIPPINGS.

The statement is made that all the varied machinery of Great Britain, now operated by steam power, is capable of performing more work, and hence of producing more products than could be produced by the labor of 400,000,000 able-bodied men, a greater number than all the able-bodied men on earth.

English *vs.* American Locks.— American lock-makers will have to look out, for, according to *Invention*, thanks to the introduction of machinery in the English lock-trade, and to other methods of improvement, American competition is rapidly becoming of less account, and now it has been determined by English makers to turn the tables upon the Americans and commence a vigorous competition with them in the Australian colonies, India and China. It appears that the Americans have obtained a strong hold in those markets with a rim (door) lock, which has a cast-iron case bearing ornamental designs, and which has the advantage of possessing a reversible bolt. The internal parts of this lock are made to template. It is now stated that a firm of Willenhall lock manufacturers have resolved to make locks of an exactly similar class, and to offer them in large quantities in the markets referred to.

The Sunken Treasure Ships.—The Vigo Bay Treasure Company received by the Lord Gough on her last trip a curious collection of articles taken from the treasure galleons sunken in the harbor of Vigo, Spain, in 1702. There are specimens of logwood and mahogany that, in spite of their one hundred and eighty-four years' submersion, are in a perfect state of preservation. Dyers who have experimented with the logwood state that it is even better for dyeing purposes than the wood now imported. The mahogany, too, is very fine and solid. One log has arrived twelve feet long and twenty-two by thirty-two inches square, which is now being sawed up to be used in the manufacture of furniture and walking-sticks for mementoes. The chief curiosity, however, is an ancient pulley-block, four and a half feet high by three feet broad, with four solid copper sheaves, eighteen inches in diameter. It is of solid oak, and was probably used in hoisting heavy articles of merchandise or the anchors. The wood is perfectly preserved, but an iron band is completely corroded away, while the copper wheels are only slightly oxidized.

The last reports from the engineer in charge of the work of raising the treasure galleons state that they have now excavated the mud from about the sides of the Almirante, a galleon carrying forty-four guns, and commanded, nearly two centuries ago, as the ancient histories have it, by Admiral Manuel de Velasco.

TRADE SURVEYS.

As one of the favorable indications of the past few days it may be mentioned that contracts for 50,000 tons of steel rails have been placed this week, and that negotiations will soon be closed for between 30,000 and 40,000 tons more for railroads in the West, Northwest, and South. Railroad building will be prosecuted mainly in these sections. Track laying in the states between Massachusetts and Missouri will be mainly in the way of constructing short lines to develop traffic. A contract for some 20,000 tons of rails was placed by foreign makers for delivery at Montreal, and buyers in the Southwest are negotiating for some 30,000 tons to be delivered at New Orleans. The rail syndicate has increased its allotment 100,000 tons, and has sold over four-fifths of the year's production. The second favorable indication of the past few days is shown in the placing of a large order for iron and steel, mainly for structural, plate and pipe iron. In fact, some iron-makers say but for the active demand for iron for piping purposes both wrought and cast, the present dulness in the iron trade would develop itself into an actual depression. A large number of towns and cities throughout the country are making extensive water and gas improvements, and the demand from this source is of great benefit to the iron trade. Among the building interests matters are much more settled than a week ago. Adjustments of labor difficulties are in progress and in a few days only the scattered fragments of the great storm will be visible. Labor is generally employed in the building trades and in all branches of industry. Better conditions are slowly developing themselves. Opinions are at variance as to the degree of injury that has been done by the agitations of the past thirty days. The chief harm, where harm has been done, seems to have been in the larger cities. In cities and towns from 30,000 to 40,000 inhabitants down, scarcely any injury has been done, perhaps because of their escape from nine and eight-hour agitations and strikes for higher wages. The architects in several cities have repeated statements made weeks ago, that the season's business will exceed that of last year, and that only in exceptional cases will work projected early in the season be postponed for another year. Real estate is rather sluggish everywhere. The expectations of holders and owners were raised last year, but the speculative movement this year did not reach the proportions which would result in extended operations. The transfers published in several cities show that the great bulk of transactions are for small properties, $5,000 to $25,000 in value. Agents in some of the Western States estimate that city lots are held at about ten per cent higher than last year, in exceptional cases one-fourth higher, and that in a good many instances desirable suburban parts which will soon be in demand for building purposes are held as much as twenty per cent above last year's figures. There is no disposition to reduce prices or force sales. At auction sales real estate is bringing good prices. Small houses are in quite urgent demand in all manufacturing centres. Comparatively few elegant residences are being erected within city limits, partly because of the high price of land, but especially because of the desire for suburban sites and residences. Western architects report increased activity and builders are under instructions to prosecute suspended building enterprises. Building material of all kinds continues low in price and is in abundant supply. Wages have been advanced in nearly all the brick yards of the country, and in the yards of New York, New Jersey, and Pennsylvania, the contracts secured and which may be relied upon during the season will guarantee steady work to three-fourths the capacity. The demand for lumber has been rather uncertain during the past week, particularly in the Northwest. Prices are likely to remain high throughout the season, the two reasons being the enlarging demand throughout the West which follows in the wake of railroad construction, and the assured heavy and steady demand throughout the East. Northwestern dealers are pursuing a more conservative course than last year, although so far it has not rewarded them in higher prices. Labor agitations there have increased the cost of putting lumber on the market, and this fact is helping to restrict the output. The arrivals of yellow pine from the Southern ports during the past week has been unusually heavy, and prices have been very firm on account of the advance in freight rates of $1 to $1.50 per M. The supply of hardwoods is abundant. The material is not at hand for the formulation of conclusions as to the effects of the agitation upon the industries at large. Some industrious journals have been taking the opinions of manufacturers and find a rather favorable expression from them, both as to the condition of trade and the effects of the short-hour agitation. The woodworkers throughout the country seemed to have suffered but little from the agitations. Hundreds of them have done more business this year than last and but few less. They accept the situation philosophically and feel able to accommodate themselves to whatever changes may come. The iron trade is in excellent shape. The hardware industries are prospering. The coal trade, especially the anthracite, was never in better condition. Demand is expanding and prices are satisfactory. The locomotive works and car works are in receipt of inquiries within the past week or two and an increase in orders is probable in those directions. The textile manufacturers are pushing their preparations for the fall trade in a manner which indicates that they have no doubts as to the result. The few railway managers who have spoken during the past few weeks give a favorable view. The broker's circulars, at least the few of them that are wisely written, read very encouragingly, and give good reasons for their faith in an enlarging exchange of products. The chronic complaint, however, and which is well grounded, viz., that profits are narrow, is likely to continue throughout the year, and exert a conserving influence upon manufacturing interests of all kinds as well as upon investors and projectors. There seems to be no good reasons for the apprehensions expressed in some quarters of evil results because of the industrial upheaval of the past month or two. The fears expressed that capital will avoid reproductive channels is largely offset by the fact that if one man's capital stays out another one's is ready to plunge in. In short, there is too much capital for such a catastrophe. Ten or fifteen years ago capital would have been frightened by the tens of millions into its hiding places as it were, at the shaking of a red flag, but to-day capital is confident in itself, in the intelligence of the people and in the irresistible tendencies at work beneath the surface of society. Labor agitations will hereafter be placed under more rigid control and scrutiny. While the dream of some of the leaders of the labor movement, that we will have no more strikes, cannot be realized, it is evident that strikes will not be as numerous as in the past, and that prolonged suspensions will be impossible. The diversification of industries is still in progress, and little industries with capitals of from $1,000 to $5,000 are springing up in the by-ways of the nation and silently drawing about them little aggregations which will constitute the most valuable market in the future for our increasing manufacturing capacity. Architects and builders in the West speak of a spirit of enterprise which is leading to the building up of the far West and Northwest, and travelling agents who are seeking out new markets for their goods and products speak of their extensions into these far-off places.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 544.

MAY 29, 1886.

Entered at the Post-Office at Boston as second-class matter.

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THE Boston carpenters who voted last week, just as we were going to press, that those members of their Union who could find work should be allowed to take it on the old basis of ten hours' labor for the same wages that they refused three weeks before, seem to connect their defeat in some mysterious way with the architects. The principal manager of the Union, in his speech announcing that the contest was officially abandoned, explained that "the trouble all came from Devonshire Street," that "Norcross Brothers had been boycotted by the Master Builders' Association in conjunction with the architects," and there seemed to be nothing left but to acknowledge defeat. As no other theory was offered to account for the Union's mishap, except the somewhat indistinct one that the master builders had succeeded in making the men "victims" to their iniquitous desire to "stamp their heels on their heads, and eat the whole oyster of their labor," we suppose that the unfortunate architects of Boston will be branded for an indefinite period as "lepers among society," unless some one raises his voice to defend them. We therefore hasten to say that we do not believe that any architect in the city so much as dreamed of exercising any influence whatever, even if he had supposed he possessed any, over either masters or men, in a quarrel which concerned only their respective rights; although the practical result of the strife has been to take away nearly all the "oysters" of the architects' labors for the year, while the opposing parties have been contending over the shells.

THE story on which the attack on the architects is said to have been based is too absurd on its face to have deceived any but the most gullible of mankind. It seems that Norcross Brothers, the alleged victims of the architects' "boycott," who are well-known contractors, telegraphed some days ago to their agent in Boston, where they had work going on, to offer their men a day of nine hours, with payment by the hour at about the usual rates. As the Norcross Brothers have long practised payment by the hour, there was nothing very extraordinary about this offer; and they were probably more astonished than any one else at learning that a gigantic meeting of carpenters had been held to consider their proposition, and that an almost unanimous vote was passed to the effect that the trade should "accept" a day of nine hours as a "compromise" between the contractors' standard of ten, and the agitators' ideal of eight. Explanations followed, and it was discovered that the Norcross Brothers had been "playing a trick" upon the Carpenters' Union, and that instead of opening their arms to the entire trade on the nine-hour basis, they had only intended their offer to apply to the men whom they had formerly employed and wanted to take back. As no contractor, not a candidate for a lunatic asylum, would have thought of anything else than this, it is rather curious that the leaders of the Union should have seen anything "tricky" or unaccountable in it. It suited their purposes, however, to pretend that the Norcross Brothers had in some mysterious way been enslaved by the "enemies" of "mankind in general and the workman in particular;" and as they could not think of any other persons to whose opinions the Messrs. Norcross were in the habit of paying much attention, they seem to have fallen, by a process of elimination, upon the architects as the authors of their woes, and, reasoning backward, they arrived at the conclusion that "the architects" must have notified the Norcross Brothers that unless their offer of a nine-hour day were immediately withdrawn "their contracts would be cancelled." It would be interesting to know how these malignant professional men would have gone to work to "cancel" a building contract on such grounds as this, but the story seems to have had just enough semblance of possibility to serve as an excuse for laying the responsibility of the agitators' defeat on persons who would not be likely to hear of the accusation or resent it. The meeting, satisfied with this explanation, broke up in great enthusiasm, after repeated raisings of the right hand, and oaths of fidelity to the Union, and the adoption of the most scorching resolutions of defiance to the "evil genius," the "selfishness," "greed" and "contemptible arrogance" of the master builders, and of menace to the "scabs" who had proved themselves a "curse to humanity," and "their own worst enemies," by "not taking part in the united effort" of those with whose opinions on a certain subject they happened not to agree.

THE Board of Managers of the Allegheny Cemetery, at Pittsburgh, Pa., proposes to build an ornamental stone fence, and entrance gate, at a cost not exceeding seventy thousand dollars, and invites architects to submit designs and specifications. A premium of one thousand dollars is offered for the plan and specification which may be accepted by the Board, but the right is reserved to reject all designs. The drawings are to be made at a scale of one-eighth of an inch to the foot, and plans and specifications, with estimates of cost, must be sent in before July 1 next. Nothing is said in the circular issued by the Board about the way in which the designs are to be judged, or whether any professional expert is to be consulted in regard to the practicable character of the plans, or the correctness of the estimates; and as architects who value their time and skill seldom care to venture into competitions without some guarantee in these particulars, we hope, both for the sake of the Board, which offers a tolerably liberal premium, and seems to wish to interest architects of character and ability, and for the sake of the profession, which suffers by every unskilfully managed or doubtful competition, that further explanations may be given. If well carried out, such a competition might be made a very successful one. The problem of designing a cemetery entrance and enclosure offers as good an opportunity for artistic expression as any that we know of, and a man of first-rate talent and skill might easily treat such a subject in a manner which would gain for him, and for the community which had employed him, enduring fame. The requirements for engaging men of exceptional ability in competitions of the sort consist simply in the guarantee of fair and honorable treatment, judgment of their works by thoroughly competent experts, and adequate remuneration. The second of these three is, to the professional mind, involved in the first, and there are few good architects, who do not regard it as the most essential condition of all. If any of our readers wish to learn more on the subject, they should write to Mr. John Perring, Superintendent of Allegheny Cemetery, Pittsburgh, Pa.

A GOOD deal is said just now about insurance against hail, and, notwithstanding the misfortunes of the older hail insurance companies, the florists of the country, who have a very serious interest in the matter, are at this moment engaged in trying to form new ones. Fortunately, perhaps, for the florists who are tempted to enter into mutual obligations of the kind, the *Spectator* has collected some statistics of the history of the hail insurance companies now existing here. Four of these are incorporated in Pennsylvania, and do a considerable business in insuring growing tobacco against loss or injury by hail storms. After from three to six years' experience, the directors of the Pennsylvania companies have concluded that they are doing a losing business. The premiums charged were high, the companies demanding one and one-third per cent in cash, and a note for six per cent on the amount insured, but even these resources were far too small to pay the losses of the last year, in the course of which forty per cent of the policy-

holders claimed indemnity to a greater or less amount. The collection of the six per cent premium note, as might be expected, excited the indignation, if not the positive resistance, of nearly all the policy-holders; while, as the whole amount so collected did not pay one-half of the losses, the policy-holders who lost property grumbled still more than those who escaped. The net result seems to have been dissatisfaction, repining and broken contracts all around. Two out of the four companies in existence last year have already retired from the business, a third is in process of winding up its affairs, and the managers of the remaining one are deliberating whether they had not better follow the example of their fellows. The fact seems to be that the business of any hail insurance company, particularly a mutual one, is usually confined to so small a territory that every storm affecting a portion of its territory is likely to cover the whole, and forty per cent losses are quite as liable to occur as smaller ones. The remedy for this would be to extend operations over a wider field, and equalize the losses in that way; and if to this could be joined regulations analogous to those of the factory mutual fire insurance companies, requiring, for example, that members should use nothing but double-thick glass in their greenhouses, a florists' hail-insurance company, at least, at such premium rates as those adopted in Pennsylvania, might perhaps, be made to pay expenses.

A RATHER significant fact is mentioned in *Iron*, which says that a contract has been made with a Belgian manufacturer for two hundred and fifty thousand dollars' worth of wrought-iron for the new Texas State-House at Austin. For several years, as it remarks, Belgian structural iron has been imported into Boston at the rate of from two to four thousand tons a year, and is sold at a rate of about two-and-one-half cents per pound, while the American structural iron costs two-and-three-quarters cents. As the imported iron pays a duty of one-and-one-quarter cents per pound, while the freight, commissions and brokerage amount to about a quarter of a cent more, it would seem that the rolled beams from Là Providence and the other great Belgian mills must cost, on the wharf at Antwerp, about one cent per pound. Curiously enough, *Iron* dismisses the subject by mentioning that a combination of the labor organizations in Texas has been formed to drive out the foreign iron by the familiar methods of the "boycott," and that all skilled mechanics are expected to refuse to work in buildings in which it is used; commenting on the obvious way in which a boycott of this kind merely takes money out of the pockets of the workmen who think that they originate it, to put it in the well-filled purses of a very small band of iron manufacturers. We suppose most architects have marvelled at the disproportion between the cost of steel rails, which are sold by the thousand tons, beautifully finished, for a little more than a cent a pound, and that of the rolled beams which they use, and for which they or their clients are compelled to pay nearly three times as much. And when, as is usually the case, the disproportion is explained by the information that the makers of structural iron have a combination to keep up the price, we can imagine that many of them have thought it would be a happy day for the art of building when this combination should be broken down. But we doubt if any one, in his wildest moments, would have dreamed that the working-men in other trades, who contribute out of their wages a very sensible sum every year to cover the unnecessary cost of the fire-proof buildings in which the dry-goods merchants keep their cases of the calicoes which they buy of them, would be the first to struggle and fight, and deprive themselves and their families of bread-and-butter, to prevent any interfereuce with the monopoly to which they pay tribute.

A SUDDEN inspiration seems to have come to the American Institute of Instruction, in the shape of a desire to do something to promote the improvement of school architecture, which, as it would appear, no one has ever thought of before. Reflecting, not without reason, that architects occasionally know something about making plans of buildings, it has come to the conclusion that its excellent purpose would be promoted by engaging the architects of the world, together with other experts, in a race for some glittering reward which should become the prize of the one who should solve most completely the problem which had occurred to the Institute. It is well known that considerations of ventilation, heating, lighting, and so on, often enter into the planning of schoolhouses, and the committee in charge of the matter has wisely decided that the details of all these matters must be carefully worked out in the competing designs, so that the victorious one may be complete in all particulars, including, besides all its provisions for "health and comfort, light, heating and ventilation," a "fair degree of beauty and ornament" on its "exterior." To combine "a fair degree of exterior beauty and ornament" with efficient provisions for the health and comfort of four hundred children, in a structure to cost no more than thirty thousand dollars, and to exhibit the solution of the problem in "drawings, plans and specifications," would give an architect of ordinary skill all the work he could well do in two months; but the Institute of Instruction, eager to reap the fruits of its idea, has limited to six weeks the time within which the competing "artists" must prepare their drawings and other documents, and submit them to the committee, so that experts of average skill, who wish to enter the race, must prepare themselves to work night and day until the allotted period expires. If any of our readers feel themselves disposed to gird up their loins for the struggle, we will encourage them by saying that they will have a fractional chance of being rewarded by a Grand Prize of sixty dollars.

SUPPOSING that ten of the racers endure the contest until the end, the value of each one's chance of securing the prize would be six dollars, out of which would have to be paid office rent and expenses while the "artist" was engaged at his work. Supposing one to be so favored as to have his rent and the salary of his office-boy paid by some one else, his compensation for the time and skill necessary to make a design as good as the best one would be one dollar per week, while that of his competitors who had to rely on their own resources for payment for a roof to shelter them while they were working, would be represented by a very substantial minus quantity. It hardly seems possible that a body of as much intelligence as the American Institute of Instruction should seriously expect people with any knowledge of the difficulties of the subject to notice such a ridiculous proposition. If it wishes to make a collection of the efforts of office-boys and tracers, who know no more about the details of lighting, heating and ventilation than they do of Hindoo cosmogony, it may perhaps succeed in getting together a few "designs" by "artists" of that stripe; but that the art of school-house construction is to be improved in that way is about as likely as it would be that a great advance in the science of teaching would be effected by inviting the college presidents of the country to enter a competitive examination for a position at the head of a new university, at a salary of ten cents a week. Some years ago a public-spirited gentleman, who understood thoroughly what he was about, established a competition for designs for a graded school-house, in which a prize of fifteen hundred dollars, if we recollect rightly, was offered for drawings involving but a small fraction of the thought and labor which the Institute of Instruction demands from its "artists." This inducement was found sufficient to interest men of real ability, and we think it may be said with truth that the result of the competition added considerably to the science of school-house planning; but it is simply throwing away money to spend it on farces like that now proposed, to say nothing of the ridicule which is thereby brought upon the subject and upon those who see fit to treat it in such a way.

THE School of Fine Arts in Paris has received from the executors of Madame Chenavard, the sister-in-law of the distinguished painter of the same name, a legacy of six hundred thousand dollars, together with some important collections of objects of art. The income of this splendid gift is to be devoted to annual prizes for the encouragement of the most diligent students in the School. The form which these prizes will take does not seem to be yet decided, but the name of Chenavard, which the deceased lady wished to have attached to the benefits afforded by her generosity, seems likely to become, for this reason, if for no other, one of the best known and most gratefully remembered in the history of art. Among the older prizes, the first to be awarded for this year, seems to be the Prix Duc, a money prize of eight hundred dollars, which was carried off by M. Adrien Chancel. Medals were awarded about the same time to MM. Bremond and Rey, and Normand and Salleron.

MURAL PAINTING.[1] — XII.

THE EDUCATION AND QUALIFICATION OF THE MURAL PAINTER.



Study for Paul Baudry's Ceiling, "The Glorification of the Law."

HAVING briefly reviewed the technics of mural painting, it will now be relevant to consider the education of the painter and his essential qualifications. Perhaps there is no more fruitful method of procedure than to analyze the training of the Renaissance giants, and to institute a few salutary comparisons between their development and that of modern men — especially of our compatriots. From what has already been expressed in these pages, the reader has doubtless drawn many pregnant deductions for himself; but, at the cost of repetition — for only by persistent re-iteration can we ever be heard — certain statements must be made. Much has been written, both tentatively and authoritatively, on the political, physical, and ethical conditions that are essential to the evolution of an artist. Some have maintained that art can thrive only within specified degrees of latitude and longitude. Some have defined the political conditions most favorable to its growth. Of these a few have stoutly affirmed that it must be fertilized by despotism — as if despotism could nourish anything necessarily so free and spontaneous as art! Others have attributed its triumphs to religious zeal. Doubtless race, climate, government, and religion enter, as ingredients, that subtle compound called art; but in just what proportions it would be impossible to state with accuracy. While we know that certain nationalities have shown a marvelous facility and disposition for the arts, while it is self-evident that under certain physical influences the practice of art is out of the question, yet it would be very unsafe to predicate what are the fittest environments for the artistic growth of civilized nations, especially in these days when modern inventions are rapidly levelling all the barriers that formerly isolated them. Eugène Müntz writes,[2] "In order to prosper, the arts exact a combination of circumstances the most complex, and no rigorous correlation can be established between moral, religious, or political development, and artistic production. The latter assuredly will always bear the impress of its surroundings, but its intrinsic value will result from very different causes. There are great nations, like England, that have never been able to form an indigenous school, and there are great epochs, like the French Revolution, that have not witnessed the birth of a single chef-d'œuvre."

It is frequently said that America is yet too callow to evolve an art. I do not believe it. If anything were to interfere with our artistic growth it would be the acceptance of so baneful and fatalistic a theory. Nothing is more depressing to the artist than to be told that his *entourage* precludes the realization of his dreams. When man is pioneering in the primeval forests he has neither such dreams nor the power to realize them. But the pioneering epoch was passed more than two centuries ago in some of our communities, communities that were established by the offspring of an old civilization. The Greek colonists of Magna Grecia produced artistic works of almost equal merit with those of the mother country; and in those days things marched slowly. Ages were then required for the evolution of a nation or an art; but recent inventions have unconscionably disarranged the time-table of the sages. Our older communities have begotten children that in a few decades have grown prodigiously. As yet they are somewhat crude and undeveloped, but ambitious and receptive. Far be it from me to nullify all that has just been said about the inscrutability of the mysteries that generate an atmosphere congenial to art, by effusively predicting a brilliant artistic career for America; but I certainly wish to demolish the counter-proposition. If freedom, youth, energy, wealth, amalgamation of race, variety of climate, and a rare eagerness to learn from others, argue anything, it is surely the life, not the death of art. The commercial spirit may at times offend, but it supplies the sinews of war, as it were, the boundless opportunities so stimulating and necessary to the production of great works. Commerce did much for the arts both in Venice and Florence.

However widely opinions may differ as to the relative merits of the modern educational systems, they must be comparatively unanimous as to their inferiority to those of Mediæval or Renaissance times. In those days the relations between master and pupil, as has been previously shown, were exceedingly intimate, the latter frequently living as well as working with the former, beginning at the foot of the ladder and working his way up to the topmost rung — if there was anything in him — passing through the successive mechanical and æsthetic stages, from the grinding of colors to collaboration with the master on an important easel or mural painting. The oft-quoted but precise words of Cennini — from which I have already drawn — give such a definite idea of the pupil's obligations that their insertion at length will be justified. "Know, that you cannot learn to paint in less time than that which I shall name to you. In the first place you must study drawing for at least one year; then you must remain with a master at the workshop for the space of six years, at least, that you may learn all the parts and members of the art — to grind colors, to boil down glues, to grind plaster, to acquire the practice of laying grounds on pictures, to work in relief, and to scrape the surface and to gild; afterwards to practice coloring, to adorn with mordants, paint cloths of gold, and paint on walls, for six more years — drawing without intermission on holydays and workdays. And by this means you will acquire great experience. If you do otherwise you will never attain perfection. There are many who say that you may learn the art without the assistance of a master. Do not believe them; let this work be an example to you, studying it day and night. And if you do not study under some master, you will never be fit for anything; nor will you be able to show your face among the masters." Again, he says, "Now then, you who, possessing noble minds, are lovers of this accomplishment, and who study the arts in general, adorn yourselves first with this vesture — namely, love, reverence, obedience, and perseverence." Such was the normal curriculum in Italy, and it will be seen that it strongly resembles that of Byzantium as described in a previous paper. It was an admirable common-sense system of education, and one that is more or less closely followed to-day by would-be lawyers, soldiers, architects, mechanics — by the students of every profession, except those of art. The pupil left the atelier thoroughly equipped. He was well-versed both in the material part of his art and in the science of picture-making according to the lights of his master. For some years he painted in the latter's style. The idea of what we call originality never entered his head. He was quite content could he slightly improve on some *motif* of a predecessor. Raphael's *Sposalizio* was inspired by Perugino's, but greatly surpassed it. After making several sketches for his *Entombment*, he finally adopted Mantegna's scheme, impregnating it with his exquisite personality. Small wonder is it that such works, the slow accretions of time and experience, were very beautiful. (It was just so in the days of the Greeks. A man died happy could he improve a moulding or a capital.) While executing his maiden commissions, the young artist kept his eyes open, drew from the paintings and sculptures of accredited masters, and travelled when his circumstances permitted. If he were intelligent and receptive he gradually emancipated himself from his master's style, as will every artist of ability sooner or later. The man who fears to be enslaved by his instructor, while following his behests, must be made of poor stuff. His artistic parentage may be revealed in the products of his brush or chisel, but why should he be ashamed of it? Do not our very faces betray our origin? Are we impeded in the race for life by our inherited experience? Do we not rather deem it so much gain, well pleased if we may add thereto our mite for the benefit of posterity? When art moves in well-defined channels its course is smooth and prosperous. The men of old had a definite purpose, knew whither they would go, and went there by the most direct route. To them the Renaissance was a tonic, not an irritant. The "Second Birth," the great "Awakening" meant liberty, not riot. The treasures of antiquity exalted, but did not intoxicate them; were used, not abused. The stream did not overflow; for its banks were high and solid, the influx gradual and controllable. But suppose the dikes had been less secure, and that tributaries from Egypt, Assyria, Persia, Japan, Greece, Byzantium, Arabia, Spain, France, Germany, etc., had suddenly poured their waters into the stream, what then? Would the artists have checked the torrent, or the torrent engulfed the artists? Something like this is happening here to-day.

It was shown in paper X that the transition from the easel-picture to the wall was an easy matter to the Renaissance artist. All their works were in the "grand style," whether on paper, panel, canvas, or plaster; so that as far as invention and design were concerned, scarcely any change was necessitated by their passage from the studio to the staging. Different technical conditions naturally exacted variations of technique, but not of conception. The line was occasionally and unobtrusively used — though much less than is commonly supposed — to define objects remote from the spectator, and to detach them from their environments. It was rarely apparent, as a line, in the best days. The figures and draperies were beautifully modelled ("finished," the layman would say,) and broadly, withal. Breadth does not mean, as some suppose, dash and coarseness; it means simplicity, suppression of the meaningless, emphasis of the broad and expressive masses at the expense of accidental, insignificant and belittleing detail. The astonishing part of Giotto's, Raphael's, and Michael Angelo's mural work — and in fact that of all the great frescoers — is that it looks well both near and far off. Every painter knows how difficult it is to effect this result, or, in the slang

[1] Continued from page 233, No. 542.
[2] Etudes sur l'Histoire de la Peinture, etc., Paris, 1886.

of the studio, to make a refined piece of work "hold" at a distance. The execution of the nude on the Sistine Vault is perfection — broad and careful, not in the least coarse or slovenly. The outlines, without being hard, are firm and eloquent, so that there is absolutely no doubt about the contour of a figure.[1] The same might be said of a hundred or more frescos of that epoch. In later, decadent days the work grew coarser, more summary and effective, and more scenic. *Bravura* took the place of heroic delineation. Modern decorators frequently paint too coarsely in the expectation that distance will mitigate the effect. Certainly, distance softens asperities, but the choice of handling should be guided rather by the degree of light than by the degree of distance. A blaze of light will reveal any undue rudeness of execution at a very considerable distance. A coarse and vigorous treatment would be far more legitimate and agreeable on a neighboring obscure wall than on a strongly-lighted one, many times more distant. These facts are strikingly exemplified on the stage. Every frequenter of the theatre, not purblind, must have been alternately disgusted and amused by the injudicious and stupid, though generous, application of cosmetics to the features of the *corps de ballet,* choruses, and supernumeraries (not to mention the superior officers); disgusted, because the effect under the tell-tale glare of gas and electricity is positively loathsome; amused, because these poor receptacles of pigments fancy, like the ostrich, with his head in the sand, that "nobody sees." Could they but imitate that long and strong-legged bird in deed as well as thought! Buffoons and clowns, failing to recognize the revelations of light, revolt oftener than they amuse the discriminating portion of their audiences.

To return once more to the Renaissance artist. We have noticed the community of style between his mural and easel work. The difference in technique was conquered in the atelier. Wall-painting was not only practised, but practised under the eye of the master, and subsequent collaboration gave the necessary confidence. Thus the pupil thoroughly solved the material mysteries of the wall. Mural painting presupposes a certain decorative proficiency and knowledge of architectural forms. These, too, the tyro acquired in the atelier. And here is another bond of union between their easel and wall pictures. Both teem with architectural and decorative motives. The Renaissance painters revelled in the suggestions of antiquity, and evolved countless combinations of column, frieze, pilaster, arch, arabesque, and garland from their inexhaustible fecundity. There was but one style of architecture — that derived from Rome — and they played with it in the full exuberance of their Italian facility. The functions of painter and architect were frequently interchangeable, and, as a result, their paintings were strongly imbued with the architectural feeling for structural harmony, and their architecture with a pictorial feeling for ornament. Their field was limited by definite bounds, and they could easily cover it.

In contrasting the training of the modern artist with that of the Renaissance, it is not my purpose to follow his career step by step, but merely to signalize certain significant variations. No one for a moment will suppose that any training however elaborate, can ever supply the deficiencies of nature. From childhood we have been told that the artist is born. This idea is so deeply rooted, that as a corollary to it, many illogically believe in the *laisser aller* system of education, *i. e.*, no education at all. It would be irrelevant to discuss here whether such a system could produce an accomplished landscape, or still-life painter, but I strenuously hold that it can never produce a figure, much less a mural painter. Monumental work must be grammatical. The phenomenal success of men like Michael Angelo, Raphael, Titian, or Rubens must be attributed in a great measure to the exact equilibrium maintained between their invention and execution. The predominance of the former marks the amateur; of the latter the professional hack. The curriculum of the mural painter is identical with that of the easel-picture painter, but must be supplemented with other exercises. Both should be thoroughly versed in the chemistry of their craft (which they are not); but besides the normally prescribed studies, the mural painter should be thoroughly conversant with architectural and decorative forms, as well as with all the material conditions that concern his department. In penning these lines, the American student is uppermost in my thoughts, though much that is here written is equally applicable to students across the seas. There are, however, unpretending schools in foreign lands, especially in Italy, that fulfill many of their technical duties to the would-be mural painter, as is evinced by the mechanical excellence of many monumental works.[2]

[1] Wilson, who had special facilities for examining the vault of the Sistine, says that these frescos excite admiration "particularly when observed from a distance of a few feet." "It might be thought that the vigorous draughtsman with some tendency to exaggeration of form, might exhibit a similar disposition in the use of the brush, but he painted in the soft Tuscan manner so much in contrast with his forcible drawing." "The heads and faces were painted with loving care and attention, the features being clearly outlined with dark, fine lines to insure distinctness when seen from a distance." "It was frequently Michæl Angelo's practice to include portions of the background in his day's work; he evidently did so to insure softness of outline." At an altitude of sixty feet the "fine lines" were not noticeable, and the contours, though clearly defined, were not harsh.

[2] I can personally attest the excellent mechanical results of the instruction at the little school of Siena, which has doubtless its counterparts in other towns. I saw several of the advanced pupils practising on the wall of a little chapel in the Campo Santo, where their professor was frescoing. Owing to his courtesy, as already stated, I was permitted to experiment with them. Maccari, a graduate of the school, painted some first-rate frescos, in the *Sudario* at Rome, though less transparent, perhaps, than the old work. I refer purely to technique. We know that Italian art is not what it was, though by no means so contemptible as many would have us believe.

Very different with us are the relations between master and pupil, than they were in Cennini's day. Instead of an authority almost paternal on the one hand, filial obedience on the other, and an intimacy quite equal to that of kinship on both, there are ill-defined connections of the loosest description. Too frequently self-assertion and distrust on the part of the pupil is met by the master's indifference. This is a logical result of the temporariness of their contract. Pupils run after a teacher till fashion ousts him, and then follow the fashion. Constant change of master is exceedingly detrimental, especially in the earlier stages of development. Every new pedagogue has always something new to preach, and were the novelty that comes with every change the desideratum, the pupil would remain a pupil till death intervened. The master should be chosen in the first place with judgment and under advice; then his beneficent counsels should be allowed full time to bear fruit. When the foundation of his education has been solidly laid, the tyro will be less distracted by seeing and hearing strange things. The superstructure may be greatly embellished by precious fragments culled here and there. How the assimilative Raphael profited by the examples of Leonardo, Michael Angelo, Fra Bartolommeo and others in his first free years! Yet such influences might have only distracted him, and proved anything but beneficial when under the tutelage of Perugino. A young pupil is not capable of judging for himself, and, if a free agent, will change instructors with the seasons. There is little analogy between the discipline of our methodical professional schools and colleges, which turn out excellent material, and the elastic regulations of our anomalous art schools, which may be entered without preliminary requirements, and for a brief or protracted period. Few of the latter have any real hold on their pupils. The private ateliers are scarcely worth mentioning; they are chiefly recruited from the amateurs, and their whole tenor is unprofessional. It is the misfortune of many able artists that they are driven by necessity to take pupils without discrimination. The public or quasi-public schools have an irresistible attraction to the serious pupil in this, as in other countries; for centralization is the tendency of the day, and the greater the pity, since the fierce rivalry of the private ateliers is a wholesome stimulant to pupil and art, saving both from a dreary, official monotony. But while it is true that there is a general tendency to uniformity of method, to the foundation of large central schools moulded on a common model, and to the unintentional suppression of the private atelier; within those establishments there is anything but unity. Art schools differ so radically from other schools that there can be but little analogy between their respective polities. Discipline in both is essential, in order to inculcate the means of artistic or literary expression. But here the analogy ceases. The range of studies in the latter is so varied, that specialists are needed to interpret them, even did a limited number of pupils permit the supremacy of one instructor. From the very diversity of their specialties, these separate units work in harmony and form an homogeneous whole, either under the control of an individual, or body of men who give it the necessary stability. Though this polity obtains in a less degree in our art schools, nevertheless it obtains with a strong tendency to develop in the same direction. But in no department of human culture is the need of a dominating personality so imperative as in æsthetics. There should be no such thing as unbelief for the pupil in the earlier stages of his evolution, faith and enthusiasm being as essential to him as to the catechumen; without them consistent progress would be impossible, for there would be nothing to build upon. Consequently in matters of taste, and especially of interpretation, there should be but one supreme authority for the beginner. Is this generally the case? By no means; for we have one master for the life, another for the portrait, a third for the antique — purely arbitrary divisions of one and the same thing. (Or, perhaps, the pupil to benefit, as he fancies, by the advice of many, and to extract the little good he may find in each, goes to one day-school and another night-school.) To work in unison the masters must be offshoots from the same parent stem; but too often they hold antagonistic doctrines, which, however interesting and sound they may be *per se*, when preached in concert craze the poor pupil, who has not always the power to discriminate between differences that are real, and those that are only apparent. Nothing but doubt and perplexity can result from such conflicting tenets. Certain auxiliary studies, involving neither taste nor interpretation, as anatomy, perspective and the like, may be advantageously pursued with specialists; but such studies only. To make matters still worse these conflicting elements are often under the control not of one strong, confident character, who might give unity to a body even so heterogeneous, but of a committee (what an innate love we have to govern by committees!) which is often made up of conflicting elements, and not infrequently recruited from laymen, who, however conscientious they may be, are generally without convictions, and hence timid. So that to the evil naturally resulting from such a government is added a general feeling of instability and temporariness that unsettles and cools both instructor and pupil.

Another, and perhaps the greatest objection to the public-school system (and I must denominate all schools public that are not absolutely under the control of the artist-instructor, even though a fee be exacted), is the perfunctory nature of the relations between teacher and taught. No man, much less an artist, can advantageously teach those who are not in sympathy with him. He is congealed at once. No pupil can profit by the counsels of a master whom he disapproves —and young America does not keep his disapprobation in the background. The very traits that have raised him high in some pursuits,

have retarded him in the fine arts, where the discipline is lax, and the restraints insignificant. There is much in art that is the result of accumulated experience, and must be learned from the experienced, a fact very difficult for the scholar to comprehend. He is far too prone, owing to the lack of sympathy and confidence between himself and master, to be led by the few hectoring pupils that are found in every school-room, rather than by his preceptor. These conclusions may seem harsh and unflattering, but if true, why conceal them? The personal experience of many years as an instructor in a semi-public school, and of several in an atelier — not to mention the experience as a pupil—has forced me to them. Yet candor and affection compel me to state that I have met with a number of ardent and intelligent exceptions. The experience of others may not tally with my own; but these pages do not pretend to infallibility; and as knowledge is the result of all experience, I contribute my own, trusting that the complement may be forthcoming. This state of things is not peculiar to our own country. I should be very reluctant to disparage the French system of education, either on my own testimony, or on that of my compatriots; yet the following significant words from an eulogistic review [1] of Hippolyte Flandrin's mural paintings in Saint-Germain des Prés,[2] though published in 1862, certainly corroborate what I saw for myself a decade later, and what has very recently been reported to me by reliable students. "No more self-denial, no more modesty on the part of the pupils, no more devotion on the part of the masters; or rather there are no more masters and no more pupils. In vain I look for schools of painting; since we must be careful not to designate by such a name those school-rooms in which a greater or less number of young people are gathered about a sorry model, that they dare to call nature. There is no instruction worthy of a master in such places, no initiative, no action on the mind of the pupils, no community of work among them, no true affection, frequently, even, no sympathy in their way of seeing. There is a cold professor who passes among indifferent pupils doling out to them from time to time some common-place advice. Where are the great intellects about which other intellects, eager to learn, formerly clustered? Where is the benevolent guardianship of former days? Where is the docility, the devotion, the loyalty, of the pupils? Where is that communion of principles and ideas that created great works? The weak leave these pretended schools with a routine that soon chokes them, and from which the strong emancipate themselves with great difficulty. All await impatiently the hour of deliverance, happy moment when they can shake off the academic yoke, and open an atelier. . . . We forget too quickly that but a few chosen ones can raise themselves unaided into the higher spheres; that the taste and intelligence requisite to follow and comprehend the evolutions of genius are already rare, and ought to satisfy the ambition of men of talent, and that there is danger of being overwhelmed in attempting the course of Phæthon. Yet never has the practice of art, never has cleverness been wider spread; and all is dispersing in vain smoke, all is at the discretion of caprice and fashion. Never was so much spent for such small and poor returns.

"But if there are no more private schools where brains ferment, where theories freely clash, and from which works are turned out with passion to uphold sound or unsound ideas, at least we have official instruction. The palace of the School of Fine Arts is one of the most splendid in our capitol; there the reproductions of the *chefs-d'œuvres* of all ages are pompously displayed, and it is impossible that with so many elements of instruction men of taste and scholarly artists should not be formed. Besides is it not inadmissible that in a country so completely administered, where the Government controls celebrated schools, in which it fits its youth for all the liberal professions, the law, engineering, the army, and medicine, there should not also be a school wherein architects, sculptors and painters are formed? That is inadmissible; nevertheless, it is true. Official instruction in the fine arts exists but nominally in France; the walls of the school are admirably adorned, but within them the mind of the pupils remains empty. The professors—for there are professors, and very celebrated, too — . . . teach the scholars neither to sculpture nor to paint, still less to compose a group or a picture; all that doubtless counts as a mere accessory, and is learned perhaps outside. . . . There are [then] no longer doctrines rallying around illustrious master artists determined to work, fight, and give their lives for the defence and propagation of their ideas; nor is there a public school where the State makes good the loss of individual force. . . . Assuredly, 'tis a sweeter task to adorn a boudoir than to contribute to the majesty of a temple; but as decorative painting has had its being in all ages, as it is and always should be the true painting for masters, it is evident that art cannot be too much encouraged in this direction."

Apropos of French instruction, I have heard competent authorities bitterly complain that pupils too frequently denied their real master — some nameless, unribboned, worthy man of the provinces, perhaps — and entered for a brief period the atelier of a Parisian notability, merely to profit by his name and fame. How many artists — not from France alone — figure in dictionaries and catalogues as pupils of this or that celebrity, who would scarcely recognize them were they to meet! Yet these same artists are well aware that they owe everything to masters more devoted, more efficient, but less widely known; whose names, forsooth, must be suppressed, because they would make but dingy appendages to their own on the official list. The tails to their kites must be flexible, long, and sufficiently weighty to steer them upwards to success. Such denials render our catalogues practically useless for educational inferences.

Before dismissing this weighty question of the mutual attitude of master and pupil, a modern tendency very pertinent to it should be briefly noted, a tendency which Hamerton has emphasized in his comparison of the actual paternal and filial relations with those of the past, and that is the growing reluctance on the part of the parent —and I will add, master — to issue the word of command, trusting and preferring that the son — or pupil—may be prompted to the right by his own free impulse, or if to the wrong, that time and salutary experience may mend and more than mend the error. This is partly due to the reaction from the stern and disciplinary past, and is partly the result of certain social and ethical revolutions that cannot be discussed here. That this unwillingness to control the minor exists is very evident, and is not without its embarrassing consequences in the training of art students.

In considering the qualifications of the modern artist for the wall, we must not ignore his accomplishments—his fine and subtle feeling for nature; his marvellous faculty for rendering surfaces; his power of synthesis, of summarily expressing in a few telling, loose, and studiedly vague strokes, life, and earth and air; his power of analysis, that enables him to interpret almost photographically the minute details of tangled reality; his love for the effective picturesque; his delight in open air — all these faculties and feelings have made him a great landscape-painter, not as was stately Claude, with his formal arrangement of temple, tree, plain and mountain; or Poussin, or Salvator, but as a free and unconventional lover of rusticity. It may be questioned whether the out-of-door feeling — *la peinture de plein air* — is a great gain; whether the essence of it, all that could be assimilated by art, was not utilized long ago by the Italian frescoists, and the dross rejected; whether many great men did not, and do not still, avowedly reject the whole of it on high artistic grounds; yet whether these are facts or not, it may be safely averred that we are intimate with nature now as we never have been before, that our horizon is thereby vastly extended, and that our close and conscientious observation of man and his surroundings is a rectifying agent of inestimable value. The mischief is done when nature is made the end, not the means, an error we are too prone to commit; yet mistakes and excesses, much as we may deplore and endeavor to avoid them, are the almost inevitable concomitants of all great revolutions. For our consolation let us bear in mind that epochs of realism have usually preceded still greater epochs of—I will not say idealism, for that word, first-rate though it be, is just now in disrepute — but of art. Something great will surely be the result of our daily friction with nature. By a closer study of it, Giotto, the great reformer (1276–1337), shattered the hieratic conventionalism of Byzantium, and regenerated an effete art, which, now ebbing with his stolid imitators, now calmly manifesting itself in the beatific but exceptional inspiration of an Angelico (1387–1455), now rising again with artists who turned once more to Nature, such as Massaccio (1401–1428), Donatello (1386–1468), and the brothers Van Eyck in Germany (from 1366 to 1441), finally culminated in the glorious age of Leonardo, Michael Angelo, Raphael and Titian. Who cannot remember, on painted wall or panel, the sweet, pious, naïve, *every-day* faces of winged angels (those of Benozzo Gozzoli [1420–1497?] for instance), that lend them that ineffable, childlike charm; or the life-like burghers, passive spectators of some great drama; or the animated busts of heroes and scholars, characterized even to ugliness; or again, the spare legs and spider-like arms of a David or a Precursor? Yet all this realism was tempered by an inherited aptitude and respect for design and composition, as well as by a passion for the antique. Following this modified realism came the generation of the demi-gods. Never was there a nicer adjustment between the real and the ideal; and how difficult this adjustment! One step too far from the real — or rather the vulgar real — and there yawns the chasm of conventionalism, into which the successors of the demigods plunged. These god-like men give us the type rather than the individual, except in the portrait (and even this is monumentally simplified); chosen, not haphazard forms; nature, at her best, but always, always, nature. However ideal the forms may be, they are founded on some suggestion, even though slight, from nature. One has only to look over the portfolio of a Raphael to be convinced. A little sketch from a fellow pupil will blossom as an exquisite angel; some bald-pated, ill-looking acquaintance, as a stately philosopher; yet neither saint nor philosopher would have that life-like ring had they been evolved purely from the imagination, and certain vital characteristics been ignored. This constant reference to nature saved these great painters from the cold, plastic academism of later days, while their idealism, which is nothing more at its best than rendering nature, in her choicest garb, rescued them from the naïve, unselected, and sometimes amusing individualism (which had its charm) of their predecessors. At the same time it made them the monarchs of monumental painting, which despotically exacts, ennobled, purified and rhythmical forms.

And what does our unconventional rusticity, or our supreme faculty to immortalize the meanest thing in its meanest garb avail us for the wall? What our boasted neglect of balanced form and beauty of line for an art that especially calls for equilibrium of mass

[1] A. Gruyer, *Gazette des Beaux-Arts, Mars*, 1862. See also, a brochure by M. H. Lecoq de Boisbaudran, entitled, *Coup d'œil sur l'Enseignement des Beaux-Arts.* Paris, 1872.

[2] The medium used for these paintings was the *huile ciré* (oil and wax) invented by Baron Taubenheim.

and harmony of contour? Of what advantage is picturesqueness to the artist whose chief aim is to avoid the accidental? Wherein does looseness of handling, or the broken line benefit the man who is ever striving to express himself with decision? For definition is as essential to mural painting as the omission of it is to the truthful rendering on canvas of variegated earth, mobile water, and glistening air. What does our photographic translation of nature's complexities bring to monumental interpretation, which enforces suppression of detail? Our out-of-door sympathies give us one thing — light; for though decorative painting must always conform to its surroundings, which often necessitate rich and low-toned harmonies, yet, as a rule, circumstances more frequently exact light and airy, than heavy and sombre tones. Nevertheless it is the stern duty of monumental painting, even in rendering out-of-door effects, to suppress the countless, incalculable, and often confusing eccentricities of direct, reflected or diffused light, and to give a strong — perhaps stronger — impression of *plein air*, by a discreet elimination.

Thus the studio practice of the modern artist aids him but little when he transfers his talents to the wall. He *may* have been thoroughly exercised in monumental composition, but the chances are against it; neither has his school nor subsequent practice acquainted him with architectural and decorative forms. His knowledge of the chemical and physical changes to which colors are liable, of the constructive details and necessities of walls and plaster is absolutely *nil*, and his technique is diametrically opposed to that of mural painting. As a rule, his sporadic efforts on the wall have not been crowned with success; for they have either borne the stamp of vast easel-pictures, or, as previously observed, have overstepped the mark, and been characterized by an almost primitive rudeness.

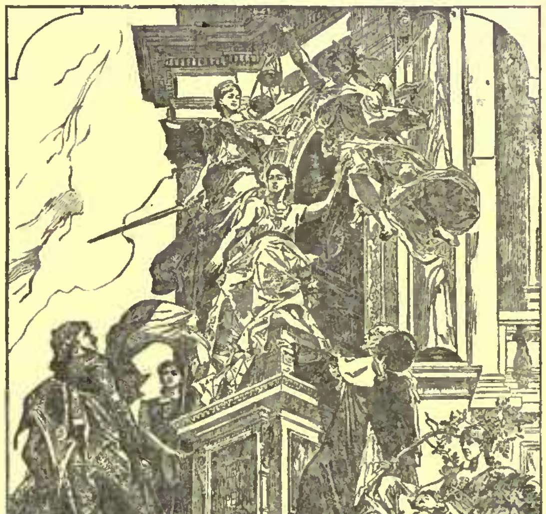
I cannot refrain from quoting here some very pertinent lines by Eugène Müntz (*Etudes sur l'Histoire de la Peinture*, Paris, 1886): "It is to the *amateurs* that the modern painters address themselves; it is by the refinements of drawing and coloring that they captivate us, rather than by the depth of their convictions. Individual fancy has replaced those emphatic rules that furnished to early Christian as well as to Mediæval art the motive of its being and its striking air of necessity." When it is remembered that the very best men in those days decorated church, palace, and public hall, while our best men paint for collectors, the sympathy between the former and their public, and the lack of it between the latter and our public can readily be comprehended.

It may be supposed that a special training, less long, less laborious, and more special, might with advantage be substituted for the ordinary routine of the art-student. Perhaps for the lower and more mechanical phases of decoration, yes; but not for the monumental painter, or for any decorator who hopes to stamp his work with his own personality, or to add one jot to pre-existent knowledge. The uninspired and shopworn decorative work—figure, floral or geometrical—that passes muster as art, is too well known to require elaborate condemnation. It is enough to say that such work is the result of a special, mechanical training, unsupported by those severe and laborious studies from life and nature which are the only true and possible source of fresh inspiration. There is no short cut; the decorator must be as conversant with vital form and color as the painter of the easel-picture, if he expects to create. That these studies, as usually conducted, can be amended and supplemented is true enough; for they are neither all-sufficient, nor at times rational; yet, as I have before observed, it is not my purpose, at least for the present, to examine seriatim the educational methods now in vogue. There is, however, one defect in them so apposite to the matter in hand that it cannot be blinked. We all know how much time and ingenuity are spent on elaborate life-drawings. Such exercises in moderation are not fruitless; yet many a clumsy hand can stump or scrub his way up to a highly-finished representation of the cast or life with a week's labor, who cannot possibly translate the same in a few suggestive, logical and inerasable lines. In other words, such work, however useful it may be, is not enough, and unless fortified by other exercises, it would never teach a pupil to draw.



From a Drawing by Raphael.

Now what the mural painter most needs is the power to delineate objects, at rest or in action, promptly, broadly and intelligently. He must not only be able to portray what he sees, but he must *know* what he sees. His sketches must be rapid and to the point, his final drawing and brushing decisive and significant. His life is too short for tentative outline or modelling. Those wonderful drawings, the legacies of the old masters, tell the whole story far more eloquently than I can. Besides these things, they teach us that the faculty for representing objects, animate and inanimate, from the imagination should be cultivated. Not only is this faculty requisite in order to improvise, to fix on paper or canvas the "first thought," untainted by models, but very frequently, also, to supply their deficiencies and limitations, both as to form and action. An artist who is dependent on his model for suggestions cannot hope to excel in an art whose corner-stone is



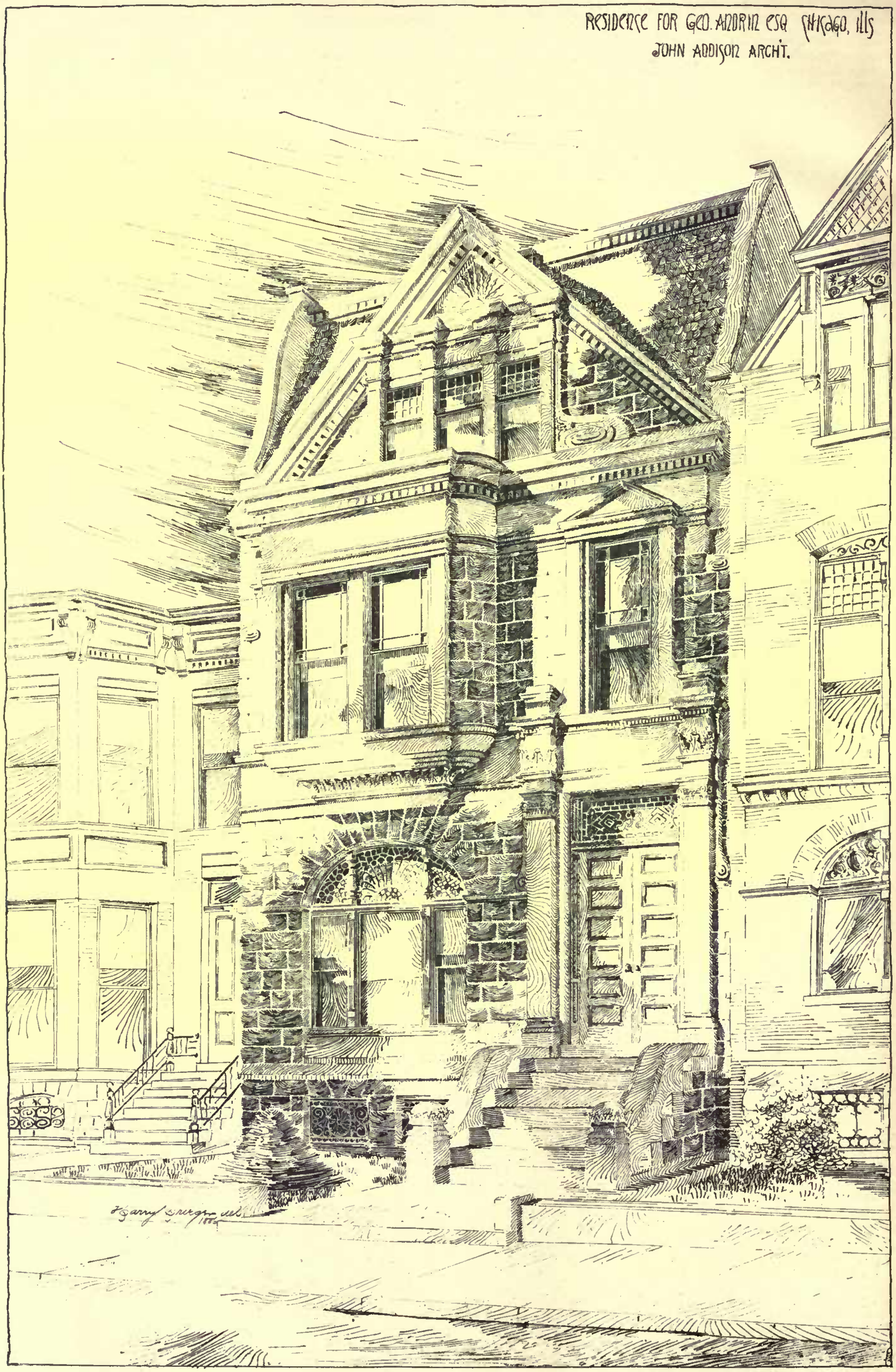
"The Glorification of the Law." Ceiling by Paul Baudry.

fertility of invention and expression. The model is but the means — the precious means — that saves us from wearisome, stereotyped conventionalism. And what shall be said of the use of the photograph as an auxiliary? Assuredly, it has its purposes; but that will be a fatal day to artistic expression, when the photograph supplants skilful and inspired draughtsmanship, and becomes the symbol of our impotence.

Would it be an act of supererogation to say that the mural painter should assiduously glean fresh suggestions from nature? that he should stock his sketch-books with memoranda of artistic expression, as well as with the countless and unexpected revelations of the life about him? that his memory should be an encyclopædia of decorative motives? Would it be superfluous to state that he should be gifted with imagination, with the power of seeing clearly, simply and beautifully, heroic compositions, and that he should be born with a feeling for rhythm? Is there need to emphasize the necessity of familiarizing himself with the immortal works of the great decorators? For in truth there are no masters equal to those whose reputations have been consecrated by time. Without some knowledge of them no education is complete. Those who can, should travel intelligently and observantly, in the land of mural painting—in Italy. It is discouraging to think how many of our students halt in Paris, at the portals of that fair country, rich in artistic treasure; or if by chance they visit her, draw inspiration merely from her superficial picturesqueness. None better than the French themselves recognize the supreme importance of a careful study of the great Italian decorators. Did not Baudy live with them before girding himself for his life-work in the Opera? Did he not fortify his natural talents by their example, without in the least enslaving them? And, finally, it is but too evident that men who are suddenly called upon to suggest fitting themes for given places, widely differing in their purposes, should enrich their minds, if not with many — and the more the better — at least with a few, well-chosen, literary masterpieces. Good literature promotes good style.

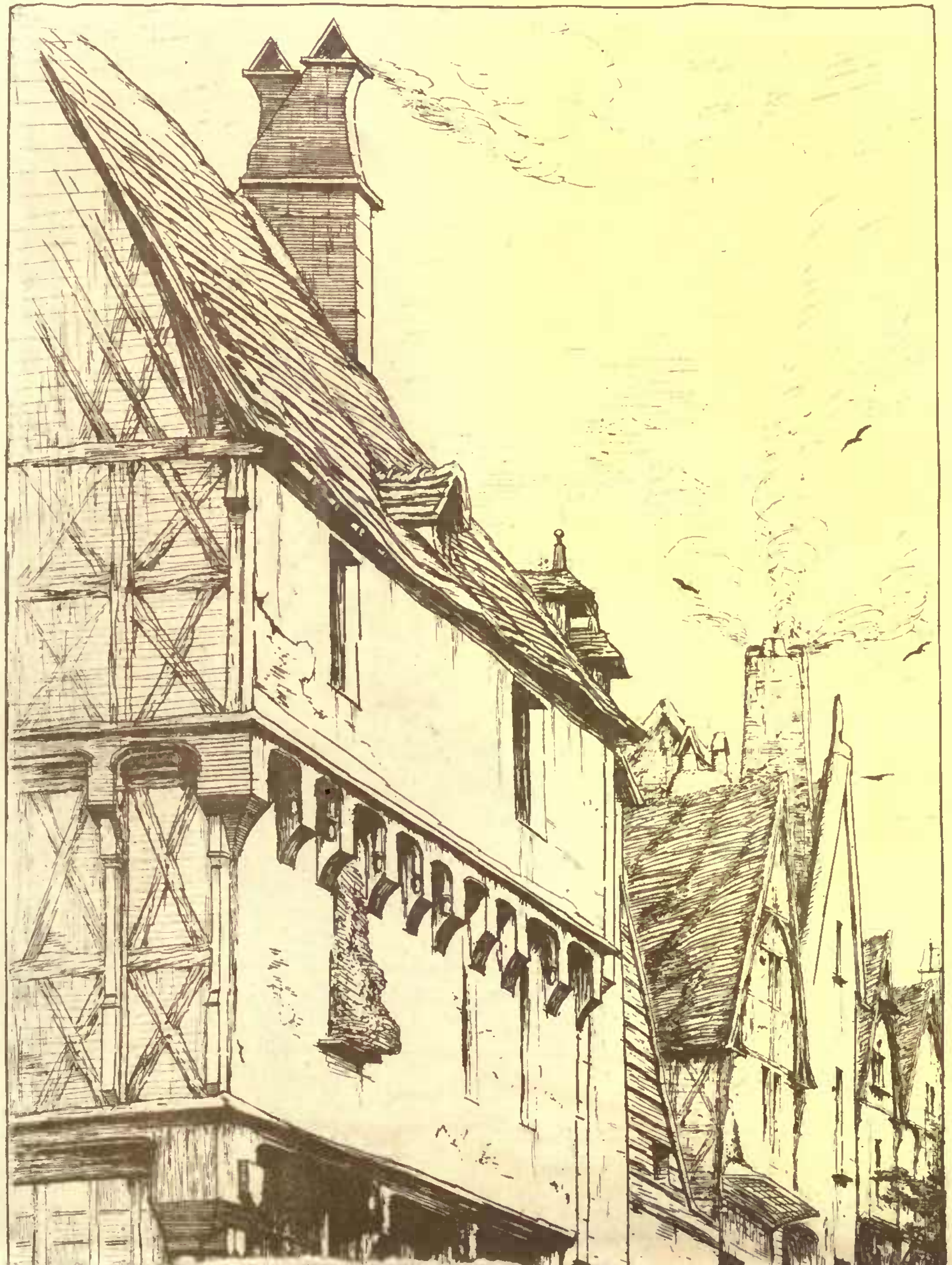
In no department of the fine arts have professionals studied and practised more intelligently and successfully than in that of architecture. The very nature of their work has constrained our architects to pursue a methodical course of instruction. They have profited by the lessons of the past, without being trammelled by them, and have proved that a respect for tradition is not prejudicial to consistent development. They have distinctly added something to art, and to our honor be it noted that their efforts have just begun to attract the

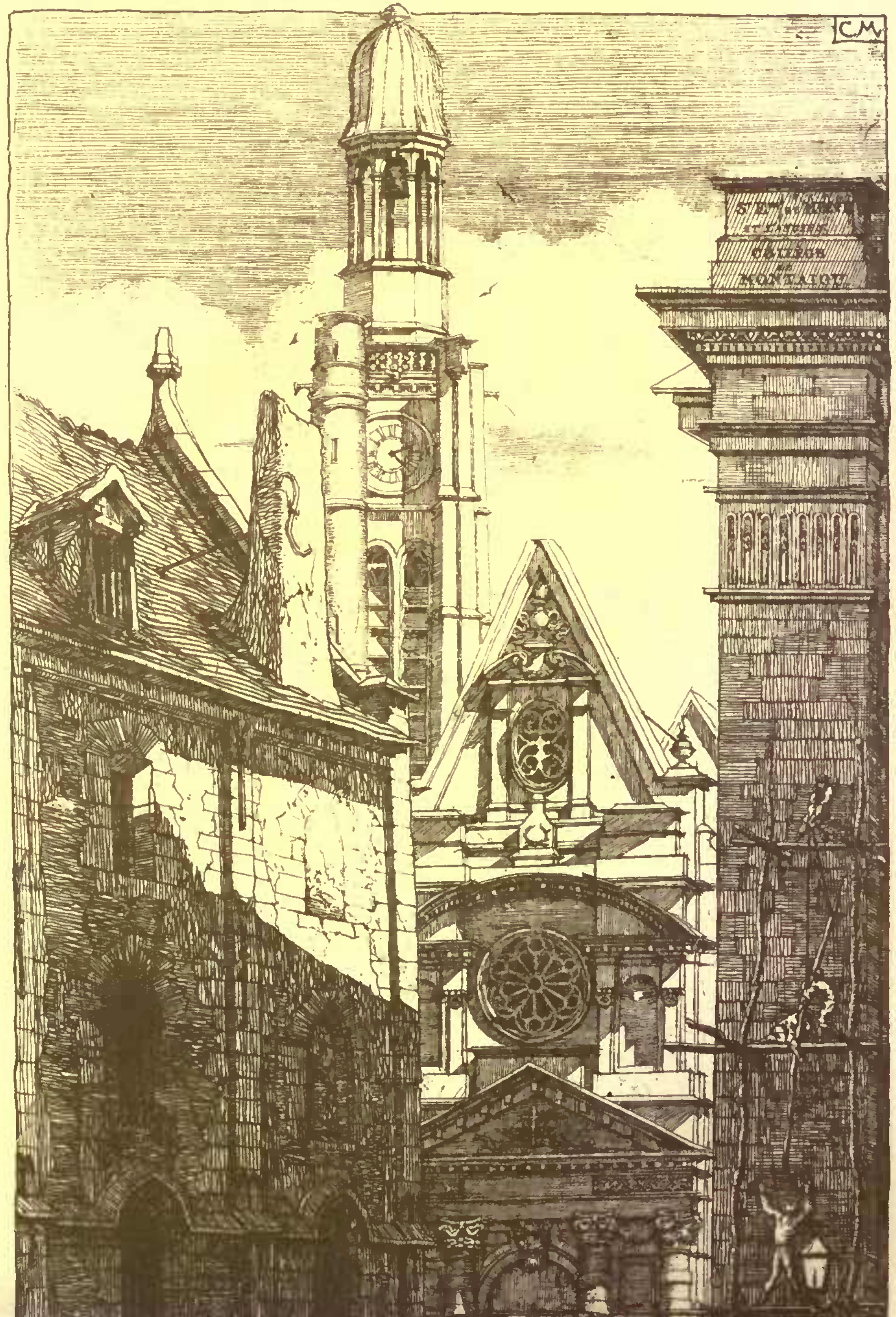
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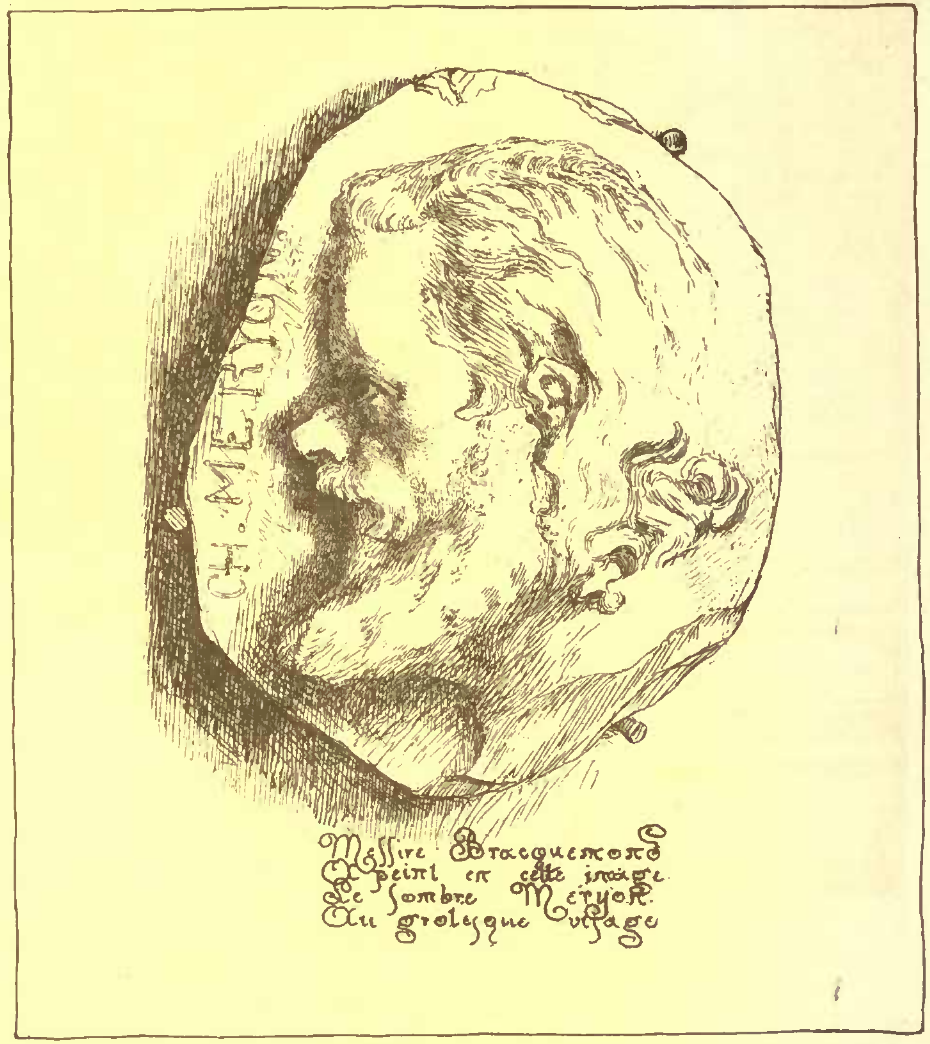
Old House at Bourges.



St. Etienne du Mont.



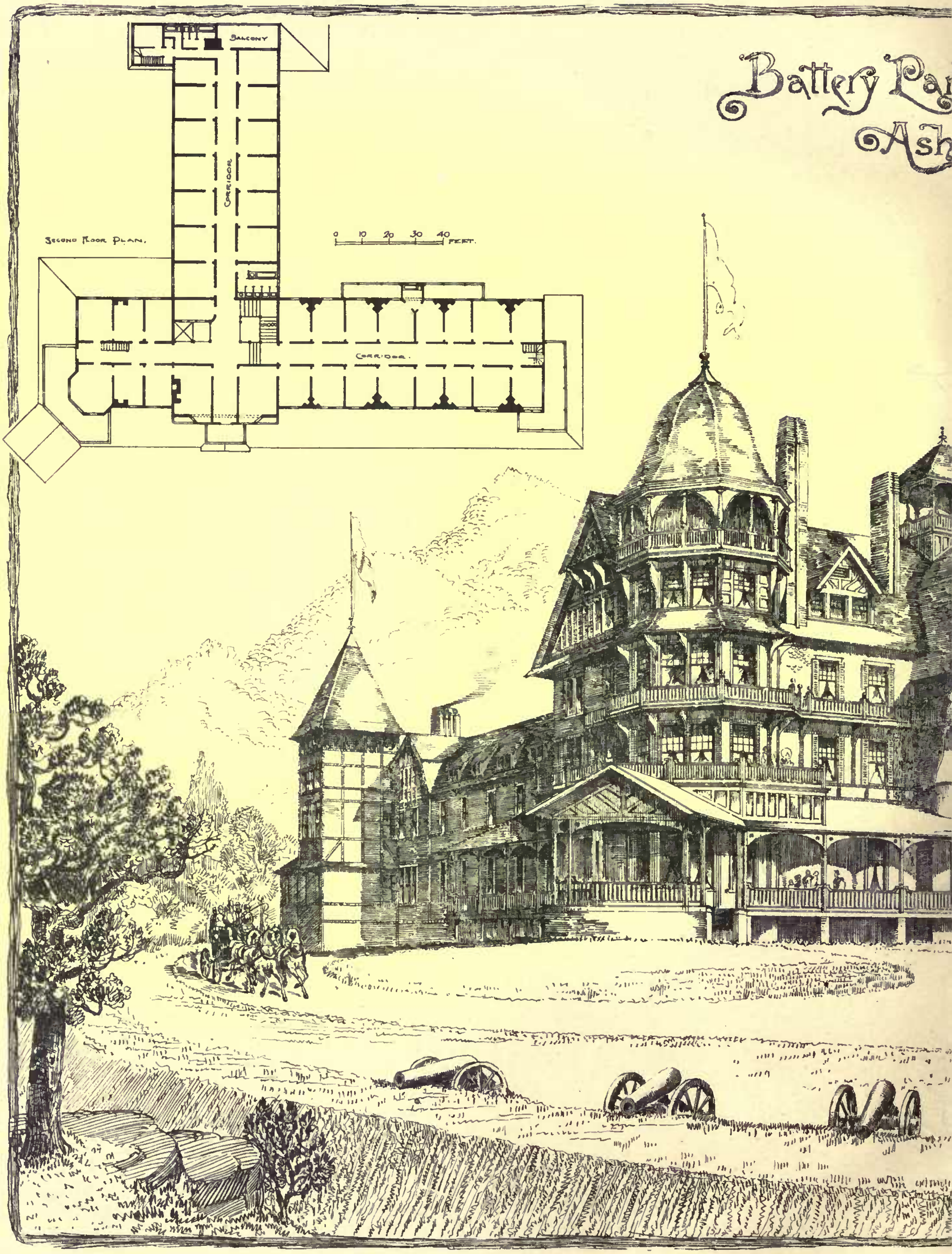
The Pont Neuf.



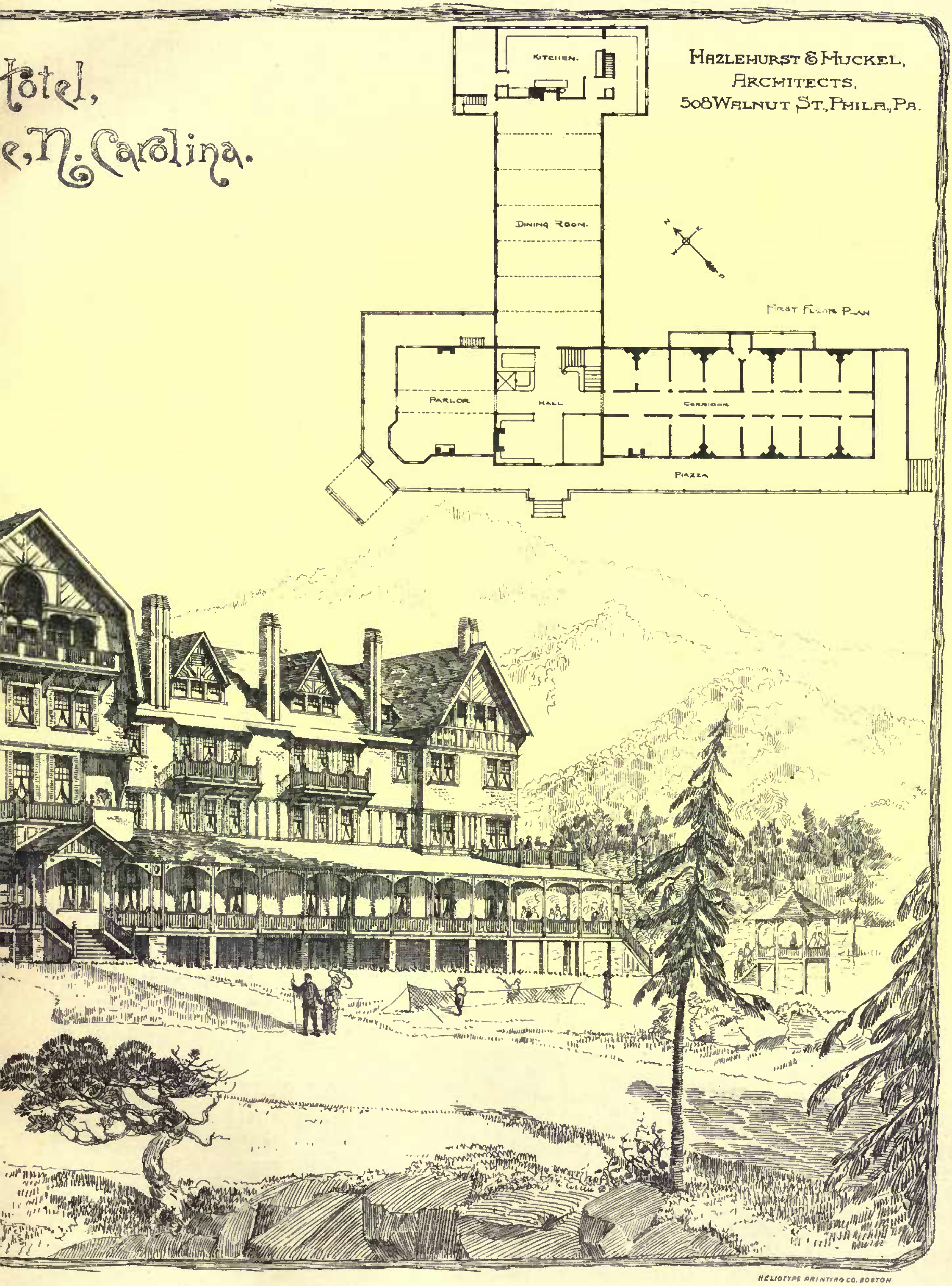
Etchings by Méryon and Portrait of Méryon by Bracquemond.

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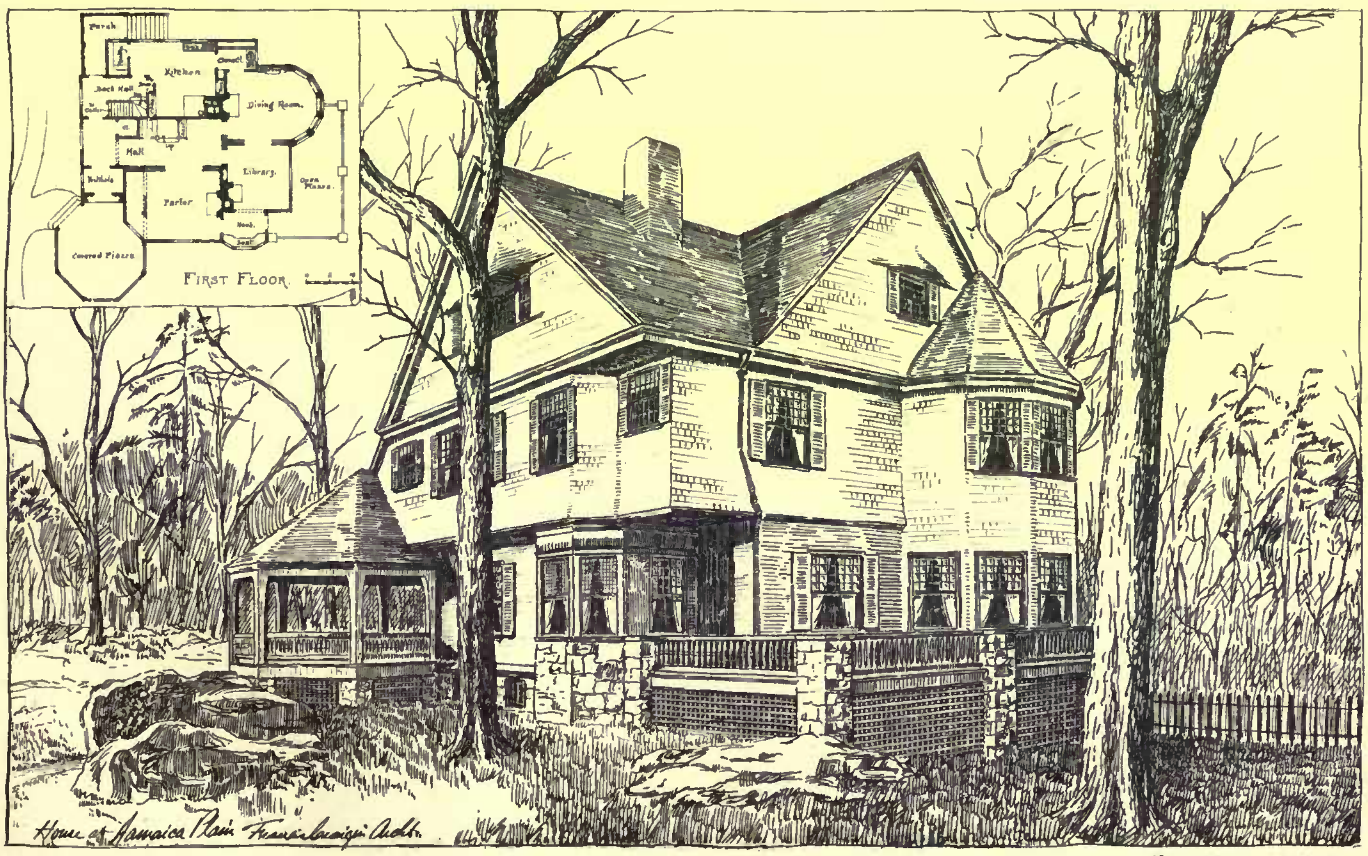
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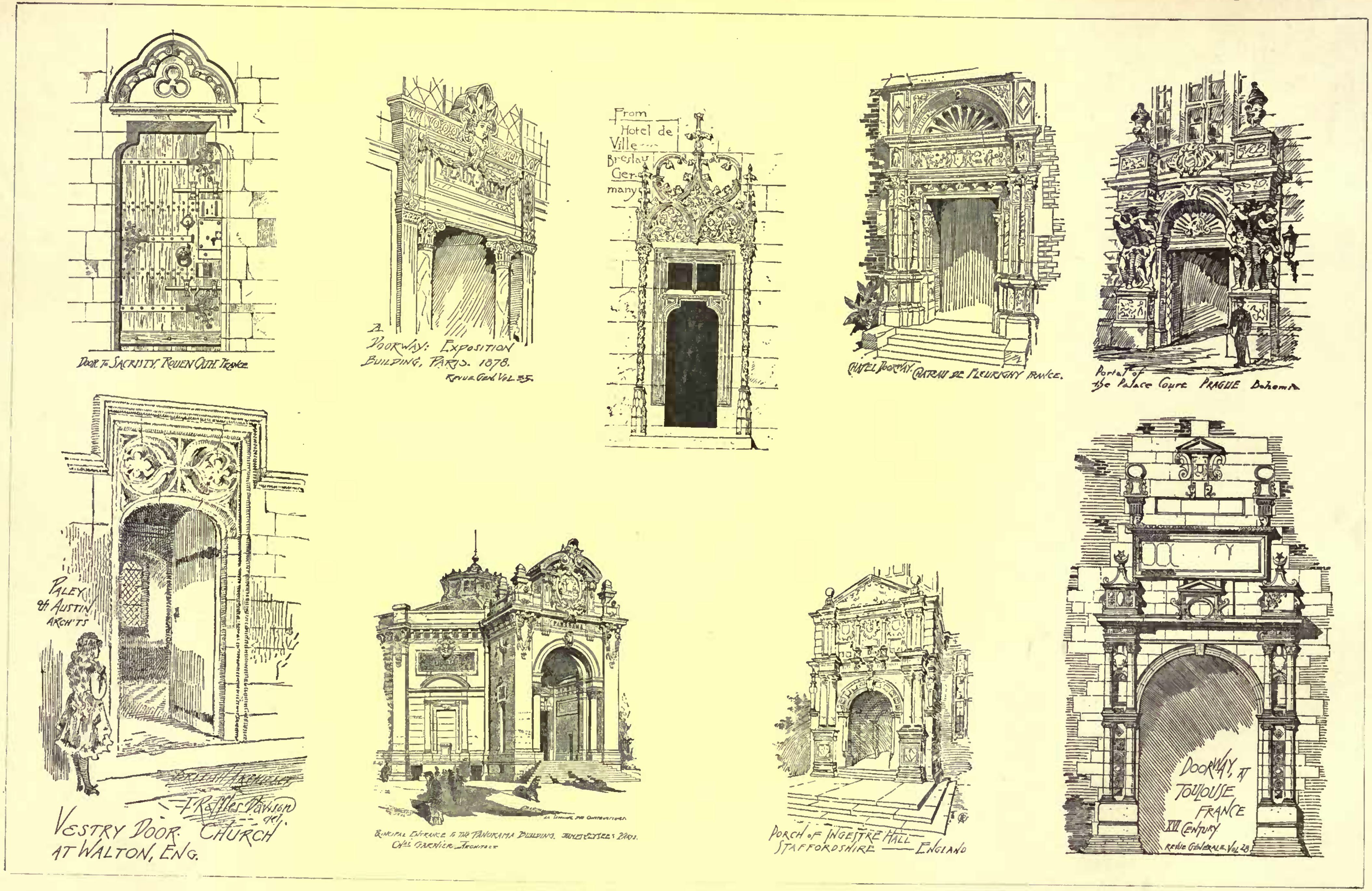
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Door to Sacristy, Rouen Cath. France
A Doorway: Exposition Building, Paris. 1878.
Revue Gen. Vol. 35.
From Hotel de Ville — Breslau Germany
Chapel Doorway, Chateau de Fleurigny France.
Portal of the Palace Court Prague Bohemia
Paley & Austin Arch'ts
British Architect
F. Raffles Davison del.
Vestry Door Church at Walton, Eng.
Principal Entrance to the Panorama Building, Champs Elysées, Paris.
Chas. Garnier, Architect
Porch of Ingestre Hall Staffordshire — England
Doorway at Toulouse France XVI Century
Revue Generale Vol. 28

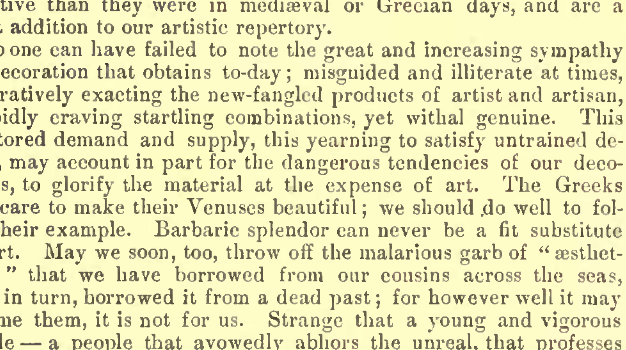
DOORWAYS.

merited attention of their foreign *confrères*. Not that they are always guiltless of solecisms and eccentricities; not that they have yet adapted themselves satisfactorily to their bewildering environments; nevertheless they are working systematically in the right direction. Their brothers of the brush may well take a hint from their methods if they hope to keep pace with them. On the other hand the architects can do much to encourage the painters, and at the same time adorn their own art by giving them the opportunity that church and state gave in past times, and in other lands whose greatest pictorial triumphs have been on the wall. We may, for the nonce, be ill-provided with practitioners, but the occasion will surely raise them. If the training, aims and technique of our artists do not particularly fit them for monumental painting, these can readily be amended without antagonism to the spirit of the age. There is no reason why we should not greatly profit by our new-born aspirations and methods, if they be consistently controlled and developed; for the field of art itself and the means of expression have of late years been greatly enlarged. Our feeling for refined and delicate combinations of color, for instance, or, more succinctly, our tone perceptions (acquired, perhaps, from the Eastern nations, who have always been gifted with them), are infinitely more sensitive than they were in mediæval or Grecian days, and are a great addition to our artistic repertory.

No one can have failed to note the great and increasing sympathy for decoration that obtains to-day; misguided and illiterate at times, imperatively exacting the new-fangled products of artist and artisan, morbidly craving startling combinations, yet withal genuine. This untutored demand and supply, this yearning to satisfy untrained desires, may account in part for the dangerous tendencies of our decorators, to glorify the material at the expense of art. The Greeks took care to make their Venuses beautiful; we should do well to follow their example. Barbaric splendor can never be a fit substitute for art. May we soon, too, throw off the malarious garb of "æstheticism" that we have borrowed from our cousins across the seas, who, in turn, borrowed it from a dead past; for however well it may become them, it is not for us. Strange that a young and vigorous people — a people that avowedly abhors the unreal, that professes a sincere cult for wholesome nature — should people their canvases with such sickly creations! Yet, notwithstanding these defects — and they are defects — I feel inclined to hazard the same remark about our decoration which I made with confidence on our architecture, that in certain departments of it, at least, we have added something new to art.

No effort has been made in these papers to draw the line of demarcation between monumental and the lower phases of decorative painting, since they fay into each other. The latter, moreover, are the almost constant auxiliaries of the former, and the same brain must conceive, even though the same hand does not execute both. If expense, perchance, should not always permit the gratification of our taste for painted epic, we can at least indulge in less lofty, but thoroughly artistic and grammatical prose.

FREDERIC CROWNINSHIELD.



Entombment of St. Catharine. Fresco by Bernardino Luini. 1460–1530.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

STOCK EXCHANGE, CATHEDRAL AND CITY HALL, BREMEN.

[Gelatine print issued only with the Imperial and Gelatine editions.]

IN the above reproduction the positions of the Stock Exchange and City Hall have been transposed, owing to the process employed. In reality, the Stock Exchange is at the right, and the City Hall at the left, of the Cathedral.

OLD HOUSE AT BOURGES, ST. ETIENNE DU MONT, THE PONT NEUF. FROM ETCHINGS BY C. MERYON. PORTRAIT OF MERYON, FROM AN ETCHING BY BRACQUEMOND.

THE three etchings by Méryon here reproduced formed a part of the remarkable collection of his works lately gathered together by Mr. Frederick Keppel, the well-known print dealer. They were exhibited for some time at his gallery in New York, and then transferred to the Boston Museum of Fine Arts, where they remained several weeks. We are indebted to the courtesy of Mr. S. P. Avery, of New York, the owner of the prints which we have copied, for permission to reproduce them.

The head of Méryon, curiously etched in imitation of an antique medallion, was done by his friend, the accomplished etcher, Felix Bracquemond, in 1852. The verse beneath is of Méryon's own composition.

The quaint old house at Bourges is said to have been built by a musician who had made his fortune. At its angle may be seen a triple pillar carved in the form of a flageolet.

In the plate of St. Etienne du Mont the old building on the left is the ancient College de Montaigu (long since pulled down), while on the right is seen part of the wall of the Pantheon.

The partial view of the Pont Neuf was etched in 1853. The tall chimney is that of the mint. The semi-circular structures on the tops of the turrets, apparently used for commercial purposes, have disappeared since Méryon's time,

Charles Méryon was born in Paris, November 23, 1821. He was the illegitimate son of an English physician and a French ballet dancer. A nervous and delicate boy, he seems to have owed all the little happiness that his life possessed to the affectionate care of his mother, whom he unfortunately lost at an early age. His father gave him nothing but his name. Méryon having acquired a taste for the sea chose that as his profession, and at the age of seventeen entered the naval school at Brest. Two years after he sailed on a French ship for a voyage in the Mediterranean as a cadet, sketching at the various places they visited and studying some time in Toulon under Cordouan, a well-known landscape painter. Later, having been made a lieutenant, he joined the sloop-of-war *Le Rhin*, in which he circumnavigated the globe. While in New Zealand and New Caledonia he made many drawings of the scenery and natives, of some of which he long afterward executed etchings intended to illustrate a book of souvenirs of the voyage. After the cruise he returned to Paris, and fearing that his health was not strong enough to sustain the hardships of a sea-faring life, he resigned his commission in the Navy, took a studio in the Latin quarter and began to study painting. Finding, however, that a partial color-blindness would prevent him from ever succeeding in that branch of art, and his attention being directed to etching by Eugene Bléry, the engraver, he studied the art under him for some months. His real master, however, was Reinier Zeeman, a Dutch etcher of the seventeenth century, whose views of the Paris of his time, some of which Méryon copied, led him to undertake his great work "*Eaux-Fortes sur Paris*," which he began in 1850 and worked on for several years. Méryon was a Mediævalist. He loved the picturesque old buildings and streets which were then still existing in Paris and perpetuated in these etchings what Baron Haussman, by command of Napoleon III, was ruthlessly demolishing to make way for his formal, if handsome, modern boulevards. Méryon's work was done amid many discouragements — poverty, neglect and contempt. At the Imperial print-room in the Louvre they knew him not, the publishers would have none of his works, the jury of the Salon refused them admission and he was forced to leave them for sale in the little shops in the Latin quarter. A few critics and artists — Theophile Gautier, Philippe Burty, Seymour Haden — saw and appreciated their wonderful qualities, but the public passed them by. For a set of the Paris views which are now worth hundreds of dollars he asked thirty francs. It is the story of Millet again, with a sadder ending, for, worn out with suffering and weakness, Méryon's brain gave way and in 1858 he was taken to the insane asylum at Charenton. The next year he was released and began work again, but not with the old strength. Signs of an imagination no longer under control are to be seen in the plates he did at this time. He grew morbidly suspicious of his few friends, quarrelled with and insulted them, and refused their well-meant assistance. In a fit of despair he destroyed many of his plates. At last, he was, for the second time, placed under confinement in 1866, again at Charenton, where this great poet-etcher died on the 14th of February, 1868. A melancholy incident has connected the miserable fate of Méryon with a rising and opulent city of America, the chief in the golden State of California. The course of his malady had been much hastened by obstacles encountered in producing an enormous etching of a view of San Francisco in 1855. It measured 39 x 9½ inches and was much the largest of his works. It was a commission from two French bankers who paid him but $240 for it. They furnished him with five small daguerreotypes to work from, which troubled him greatly, they having been taken at different times of the day with different lightings.

Mention should be made of the fantastic verses, composed and etched by himself, with which Méryon often enriched his plates. We give a free translation from Mr. Keppel's catalogue of the first verse of several which he attached to his plate of "The Morgue": —

"Stay, ye passers by!
Here, like a charitable mother;
The city of Paris
Grants always to her poor children
Both bed and table gratis."

Like William Blake he imagined that he saw visions which he tried to describe in his poems and etchings; but the English artist married, lived happily, and died full of years, while Méryon knew

no joy save in his art. Méryon executed ninety-seven plates, a number of which are small and unimportant. His master-piece is considered to be the "Apse of Notre Dame." Among his finest etchings are "The Morgue," "The Pont au Change," "The Rue des Mauvais-Garçons," and "The Turret in the Rue de la Tixeranderie." The great Cathedral of Notre Dame dominated his Paris plates, for, like Victor Hugo who greatly admired Méryon's work, he saw in it the embodiment of the Paris of the Middle Ages. All Méryon's architectural etchings are tinged with this same mysterious and sombre spirit. One of the most curious shows the figure of a demon, one of those which are carved in stone at the angles of the towers of Notre Dame. This hideous horned and winged creature rests his head in his hands and looks fixedly at the panorama of Paris which is spread out before him. Four black ravens are flying about, and on the left is seen the tower of St. Jacques, while all around stretches a vast expanse of roofs and chimneys. Hamerton describes this demon as gloating with satisfaction over the sin and misery which he has witnessed in the great city, since he took his place high up on the cathedral hundreds of years ago. This plate is called "The Stryge." Another example of the unreal quality which entered so largely into some of his plates is in "The Pont au Change," where in the evening sky a flight of albatrosses soar above a flock of wild duck. It was a fancy of Méryon's, Burty says, "that at the close of day, eagles and other birds of prey were let loose from the Tuileries, whose threatening flight carried trouble into the peaceful minds of the citizens, and recalled to them the triumph of the *coup-d'-état* of 1851." He often worked over his etchings, and changed them in many details. One state of "The Pont au Change" is without the crescent moon or the birds mentioned above, but has in their place a large balloon, inscribed "Speranza," which rises majestically in the air amid the acclamations of the crowd on the bridge. "The Palais de Justice," superbly drawn, occupies the right of this plate, while beyond the bridge is seen the picturesque pump of Notre Dame, a favorite subject with Méryon. The beautiful effect of sky in this etching is the finest which Méryon ever produced. Other wild fancies of his are seen in the plate of the building of the Ministry of Marine, where the air is filled with monstrous flying creatures, half marine and half ærial, and in his bird's-eye view of the College of Henry IV, where part of the work is exact, and the rest quite untrue to the facts. He mingled in the clouds which sailed above some of the buildings which he drew with the keenest perception, and the most unerring draughtsmanship, fragmentary episodes of his tropical voyages and reminiscences of ancient mythology. His gloomy cast of mind is seen in "The Morgue," where on the bank two men are carrying the corpse of some poor drowned wretch towards the steps leading to the morgue, and to which a *gendarme* points. The victim's wife and child are sobbing bitterly, while a curious crowd watches from the wall above.

Yet Hamerton truthfully observes, "He had great subtlety and delicacy of observation, and a perception of truth so clear, that it is strange how such bright insight can have been compatible with any cloud or malady of the kind." Again, he says, "His work was sanity itself, by its perfect and equal acceptance of various facts, by its patience and steadiness in study, by its caution and moderation in manner. As an etcher, Méryon was remarkable for great certainty of hand combined with extraordinary caution. When at work from nature he stood, and without support of any kind, held both plate and mirror in one hand, laying the lines with the other, and so steadily that the most skilful etchers marvelled at his skill." Burty says, "He had been noticeable, when in the navy, for his finely-made, yet strong hands. His keenness of sight was remarkable. He could distinguish the finest architectural details in a building as well as if he had used a telescope. His plan of working was this. He seldom made a complete drawing on the spot. He fixed on his subject, and then he went patiently every day at the same hour, and drew on small pieces of paper studies of the various portions, rigorously exact in their details. These he either stuck together when he returned home, or else made a drawing from them."

Hamerton's verdict is that Méryon was "the most accomplished architectural etcher, not only of this century, but of all centuries; not only of France, but of the world."

BATTERY PARK HOTEL, ASHEVILLE, N. C. MESSRS. HAZLEHURST & HUCKEL, ARCHITECTS, PHILADELPHIA, PA.

THE building is now in course of construction, and is to be completed this summer for occupancy. It is both a winter and summer hotel, all rooms having open fireplaces, and the building being heated throughout by steam. In size it is 200 feet long in frontage, and 170 feet deep; average width, 52 feet 6 inches. The tower, which is at the angle overlooking the French Broad River, is 150 feet high, and has an extended view, both up and down the valley, of over 200 miles. The location is on a knob of the Blue Ridge, on what was, during the late war, the site of Battery Porter, the old earthworks having to be removed to make way for the present building. The altitude is 2,800 feet above the sea, on the line of the Western North Carolina Railroad. There are one hundred and fifty chambers, and accommodation for four hundred to five hundred guests. The dining-room is 40 feet by 90 feet, clear of all posts or columns. The building is provided with steam, elevator, and lighted throughout, with Edison electric light. The owner is Col. Frank Coxe, of Philadelphia. Cost, $100,000 complete.

RESIDENCE OF GEO. ANDRIN, ESQ., CHICAGO, ILL. MR. JOHN ADDISON, ARCHITECT, CHICAGO, ILL.

HOUSE AT JAMAICA PLAIN, BOSTON, MASS. MR. FRANCIS CRAIGIN, ARCHITECT, BOSTON, MASS.

LECTURE ON ARCHITECTURE.[1] — II



Plumpton. Ch: Sussex Eng.

"ARCHITECTURE has been called petrified music, and its highest excellence said to be the achievement of harmony of proportions among harmoniously selected or invented elements. But every art, as we have seen, is entitled to claim for its master works its ideal manifestations, the praise of harmoniousness, and thus to have a like claim to an analogy to music. When the sculptor designs a group of which the masses and the lines present themselves to the eye in such relations that our attention is delightfully detained and travels over the work and returns from one comparison to another, we are conscious of the same sense of harmony as when we are led by music through many a winding bout,— "of linked sweetness long drawn out." As the painter realizes his ideal and brings his work to a close, he is conscious of his tints, his lights, his forms, his distances falling at last into due relation, and "conquering in a full and natural close — like music."

Architecture, however, has this special analogy to music, that the elements by combination of which it produces a sense of harmony, are susceptible of being brought to the actual test of numbers. The painter relieves one color by another under guidance of his eye — of his sense of color-harmony; there is no doubt that his harmony does ultimately depend upon a certain quantitative proportion, but what this is defies analysis to define and determine. On the other hand, though the violinist, in tuning his instrument, trusts to his ear as exclusively as the painter to his eye, it remains a fact that the latent cause of the harmony established between two strings depends on a certain proportion between their rates of vibration, a proportion which may be brought to an absolute numerical test. The relative lengths, weights, and tensions of the strings which are in tune together may be accurately determined as governing the result by a definite law; and in the same way, the elements of architectural harmony are susceptible of measurement; and, as we shall find in the case of admittedly the most harmonious example of Greek architecture, declare themselves as owing allegience to certain definite principles. In music we deal with the proportions of audible sounds, which may be expressed numerically; in architecture, with the dimensions of space, which may be determined by rule and line. The best preparation for appreciating what I have to lay before you in the next letter as to the practice of the best Athenian architects in effecting that harmony of proportion which has been the delight and marvel of all beholders for ages, will be to set forth in the first instance the value in art of precise proportions — of definite proportions — of proportions between comparatively low numbers, as certified and exemplified in music. This is the more desirable as it will enable us to perceive not only the agreement of musical and architectural harmony in principle, but to preclude that liability to press this agreement into applications which the contrasted conditions of the two arts repudiate.

So, also, we may clear the mind of a false assumption as to the function of schemes of architectural proportion. No one supposes that a musician composes a movement by a process of calculation from the proportions of his scale, and as little that his imagination works without allegiance to the laws of thorough-bass. And so it is that familiarity with the nature of proportion will not enable an architect to evolve the beautiful as he might solve an equation in algebra, but may stand him in good stead nevertheless.

Whether two notes harmonize, are perfectly or approximately consonant, as sounded consecutively or together, depends upon whether the vibrations which severally produce them have or have not certain periodical coincidences — the more frequently these coincidences recur the more complete is the consonance; and then, on the fact whether the ratio of coincidence is in terms of the simple integers 2, 3, and 5, the lowest of the prime numbers, or their multiples, to the exclusion of the next lowest prime numbers, 7, 11, and 13. When to these we add the third fact, likewise determined, not *àpriori* but by direct experiment and experience, that double the number of

[1] By W. Watkiss Lloyd, read March 4th at Royal Academy of Arts, Burlington House. Sir Frederic Leighton, P.R.A., in the chair. Continued from page 246, No. 543.

vibrations in the same time — that is, the coincidence of every second vibration only—reproduces the same note at a different pitch, as expressed by the ratio 1 : 2, it is a mere matter of tabulation to bring out the proportions of the notes of both major and minor scale as a necessary remainder. If we write out a scheme of all the simple numbers combined in pairs, and strike away first all duplicates, and then all in which 7, 11, and 13 are factors, we shall have the musical scale as a residuum. Why two sets of vibrations, of which every seventh of one coincides with every eleventh of another, or every eighth of one coincides with every thirteenth of another is not agreeable, I believe, is capable of explanation, but cannot now be discussed; it may suffice to know, that because such is the matter of fact as regards musical notes, it by no means follows that such proportions are inapplicable in architectural details, as may not occur in the combinations of chemical atoms. It is unnecessary to say that the scale which is thus brought out lays no hampering restrictions on the musical composer. By a simple principle that may be expressed in a short sentence — it divides itself — into a major and a minor scale; and every note in it may become in turn an original key-note, and propagate again a new series of notes and new arrangements of major and minor scales.

Before quitting the consideration of musical proportions, it is desirable to notice those combinations of three notes which are termed chords; the principle of the consonance of these will be found to illustrate by analogy those architectural adjustments — at least of the Greeks — which involve three associated dimensions, as, for instance, of height, length, and breadth.

The vibrations which produce the several notes of a perfect chord in the major scale, have the proportions 4 : 5 : 6; so that the difference between any two is unity 4 : 5–5 : 6 and 4 : 6–2 : 3.

In the inversions, one pair exceeds this difference, viz., when the vibrations of the three associated notes are coincident in the numbers 3 : 4 : 5 in which 3 : 5 has the difference between the terms of 2; and so again in the numbers of the second inversion, 5 : 6 : 8, 5 : 6 and 6 : 8 = 3 : 4, but 5 : 8 has a difference of 3.

The perfect chord of the minor scale present the series of less simple numbers, but having the same characteristics, 10 : 12 : 15 = 5 : 6–4 : 5 : 10 : 15 = 2 : 3.

The inversions, 12 : 15 : 20 = 3 : 4–4 : 5–3 : 5, and 15 : 20 : 24 = 3 : 4–5 : 6–5 : 8.

Both in the minor and the major modes, the ratio of the perfect chords are all super-particular, that is, they have a difference between their terms of unity; and in both modes, also, the inversions include one ratio which has the exceptional difference of 2, and another with that of 3 (viz., 3 : 5 and 5 : 8). The same systems of ratios are, of course, applicable to any other thing which are of like nature, and the same proportions which exist between three notes may be applied to three masses or three dimensions. Thus the length, breadth and height of an apartment may have the same numerical proportions as the vibrations which produce the three notes of the perfect chord, viz., 4 : 5 : 6. Or the three diameters of a column, taken at the base, the neck and the echinus of the capital might conceivably be regulated by these ratios, or by those of one of the inversions.

But when we pass from audible sounds to visible dimensions, we are no longer bound, as I have said, to the ratios of musical scale and chords. Still, what I shall have to set forth by the positive proof of cumulative examples is, that the Athenian architeet, Ictinus, valued the principle while giving it a larger application. We shall see that he showed a predilection for triads of dimensions of which the ratios had the same numerical difference between the several pairs, though a difference not restricted to unity.

Such a case is presented to us when we find breadth, height and length proportioned, as 4 : 9 : 14, giving the three ratios, 4 : 9 = 9 : 14 — (4 : 14 =) 2 : 7, each having the same difference of 5 between their terms. Nor are there wanting grouped triads of dimensions, of which only two pairs of the terms exhibit ratios of common difference, yet are valued nevertheless in direct analogy to the inversions of the perfect chords. Now, the cases to which I find the Greek architect applied the system of regulation by proportion — by proportions susceptible of expression in low integral numbers — are chiefly two: —

1. Cases of what I will call rectilinear proportion — either when proportionate dimensions were measured off upon a right line — or upon parallel right lines.

2. Cases of rectangular proportion — when proportionate dimensions are measured off on lines at right angles to each other — as is the case, for instance, with the length and breadth of an apartment.

3. Cases of proportion of areas — especially of the sectional areas of columns; circles being proportioned to each other as the squares of their diameters.

But while the Greek architect held himself released from the comparatively restricted range of ratios, to which the musician is bound by the special conditions of ærial vibration, he fully recognized, in responsibility to that unity of effect which is common to all the arts, the obligation to select, and to confine himself to, a scale.

Such a scale, adopted for a particular design, would be the equivalent of the key which the musician selects as appropriate for his theme. It is the sentiment of the theme which determines the key, and, in like manner, it must be the maturing conception of an architectural design, both as regards his purposes in use and its appropriate grade of dignity which controlled the selection of a scale. It is unnecessary for me to insist on the analogy of a scale of color, which becomes salient at once when we pass the eye from one to another of any pair of fine pictures. All possible proportions between two quantities are included between absolute disparity, 1 : 0 and complete equality, 1 : 1. Let us take two equal lines and, leaving one unaltered, as a standard, alter the length of the other by continuous diminutions. In this process we shall successively pass points which give proportions between the two lines that may be expressed by whole numbers — sometimes larger, sometimes simpler, that is by ratios as different as 99 : 100, 17 : 14 and 3 : 2. Among this crowd of ratios even those of comparatively low numbers are very numerous; and to make use of them indiscriminately would contravene the very purpose of art — which is to give definition and distinctive character to its work. The same mischief would result as if a painter, instead of setting his palette with reference to a certain tone and subordination of tints, were to take colors at random.

The requirements of a scale are, first, that it shall provide some certain proportions which are indispensable for the particular purpose in hand; for instance, which shall be applicable to the plan of such an oblong apartment as is demanded for due exhibition of an erect statue.

In the next place beyond such imposed conditions, some other ratios, in themselves not so absolutely prescribed, will be required and useful, and may not be difficult, to determine if the artist has already realized in his imagination the general effect that he is anxious to reduce to form. If such a conception has truly artistic value, of whatever style or grade, it is most certain that this must be due to some underlying principles of proportion to some prevailing characteristic ratios. By the determination of certain of these, the projected scale acquires some additional fixed elements. But it is the artistic conception which must be sent in search of the scale, not the scale which. by any process of mechanical manipulation, will put us in possession of an artistic conception, a poetic ideal.

Again, when the completion of the hypothetical scale for a given building is in question, we have the guidance not of the musical scale, but of the analogy of that scale. A sufficient variety of intermediate intervals is required for command of contrast and of gradation, distributed between the two extremities of 1 : 0 and 1 : 1. The sequence must not be crowded, which would forfeit distinctness; nor leave excessive vacancies, which would entail harshness in transition.

The character of such a scale would depend upon the primary selection of the leading proportions, and then on the intervals admitted between the several degrees of the scale, principal and subordinate. Its full characteristic effect in application would depend on the judicious insisting on certain chief proportions, by the employment of these first in the most important places, and then in a greater variety of combinations. Emphasis is thus given to a certain proportion when it is applied to govern in turn the dimensions of a plan, of an elevation, of the spacing of columns, of the divisions of a frieze, and so forth.

I will now illustrate these observations by the exhibition of the scale of proportions which was employed by the architect of the Parthenon. That it was so employed by him, I entertain no doubt that I can make quite clear to you in my next lecture; and until then, I must ask you to take the fact provisionally for granted.

I find then that the architect of the Parthenon in proportioning its plan, elevation, profiles and general details, adhered to a scale of which it is characteristic that the terms have a common difference of 5. Such a series, so far as he thought it applicable, runs on thus with a constant and gradually more rapid approach to equality between the terms.

1 : 6–2 : 7–3 : 8–4 : 9–5 : 10–6 : 11–7 : 12–8 : 13–9 : 14–10 : 15, etc. Of this series 5 : 10 and 10 : 15 are respectively equivalent to 1 : 2 and 2 : 3 terms having a difference of unity which are technically called super-particular ratios. This series continues 3 : 4–4 : 5–5 : 6, etc.

The intervals with differences of 5 become, as the series is extended, too close for distinctness; an extension of it is then gained by resorting to the super-particular ratios which recover the advantage of very low numerical expression. The particular scale has certain great advantages; but again, I must warn that it is only one of many which might be selected, each having a special applicability.

Now what is asserted — on proofs which, as I have engaged, shall be forthcoming — of the practice of the great Athenian architect is this. That starting from a certain definite dimension imposed by the conditions of the required structure, he made this the basis of his primary proportions; that he thus determined the length of his plan by a proportion to its given breadth of one hundred feet, and the height again by another proportion; subdivided his elevation with reference to the same or other proportions out of the scale; and so on, even to the division of quite subordinate members.

There is one inevitable consequence of the adoption of such a system for determining dimensions, which must be recognized; it is, that we have to give up all hope of setting them out by the foot rule, or any rule having uniform fixed divisions. None of us probably would doubt that if we took the measurement of the dimensions of this room, or of any article of fitting or furniture in it, we should find that it corresponded very accurately with a certain number of feet and inches. But nothing of the sort is detected in the Parthenon; the Greek foot is fully ascertained, its current subdivisions are well known; but it is much if more than two dimensions can be certified as having been determined with reference to it.

An example will make this position easily understood; if it is required to obtain a dimension which is proportioned to one hundred

feet as 9 : 14, we shall have as result sixty-four feet, three inches, three-eighths, and still with a remainder; and with the exactness which was prized as essential by the Athenian, the inches and fractions could not be neglected. And then the fraction-burdened dimension has to be made the basis of another deduced proportion, presenting a still more embarrassing result.

These complications would ensue equally, whatever form of fixed subdivisions might be adopted, whether feet and eighths, feet and tenths, or any arbitrary and even variable subdivisions of a modulus. In no example of a fine Greek building have the parts and members been found measurable with any approach to plausibility, in terms of a modulus.

Of course if we adopt a unit of excessive minuteness, we may technically escape this difficulty, but only by running to such a number of places of decimals as baffles useful application, and leaves us with no light as to simple principles of proportion. This observation applies to the various systems which have been proposed and employed for guidance in proportioning the human figure. If we divide the head or foot into very small aliquot parts, we may set down exact dimensions in such terms for every limb, and so far obtain a memorandum, either numerical or in form of a diagram, which will preserve from any gross disproportions; but such schemes afford no insight into the fundamental relations on which the marvellous harmonies of that most marvellous of all organisms really depend.

And as in nature, so in architecture or in any other art, this principle is to be kept in view, that proportionate relations are only to be recognized as applicable between terms which are essentially correlative. Such, for examples, are solids and voids, as windows and intermediate wall space; columns and spaces between columns; lengths and breadths of areas; subdivisions of the same architectural member, and so forth. There is no sense in snatching at commensurabilities of parts which are under no rational obligation to be commensurable.

Parts which are connected by the tie of proportion in their dimensions, may be more or less similar in character; and as they verge towards dissimilarity, they naturally lend themselves to effects of contrast, which may be reduced or reinforced by proportion. The solid column is in contrast with the void intercolumnar space; on the other hand, the difference between the upper and lower diameters of a column more easily contributes to an effect of gradation.

The practical significance of harmony is true to the etymology of the word, as implying accuracy of fitting together; and the precise adjustment, the conciliation for definite efficiency of elements which, if not so controlled, are refractory and mutually embarrassing, is the very triumph of ingenuity and art. It will therefore be readily understood that regulated contrast must be an all-important factor of harmonious and vigorously characteristic expression.

It will be the purpose of my second lecture to develope the application of these principles definitely and in detail, to show with what profound analytical instinct the Athenian architect selected the pairs of terms which he decided to link with each other proportionately, and selected further the particular linking proportion in each several case.

Now if the principle here set forth has any value in the combinations of art, it ought to be confirmed by comparisons with those natural combinations,—with those organisms of which the beauty and expression equally depend upon a harmony of the associated parts as members, in kind first, and then in proportionate dimensions of those parts.

What do we find to be the case in the human figure, — the most complex and most perfect of all known organisms? The primary fact of bilateral symmetry, of the repetition of like parts with transposition from left to right, on either side of a median line, is of course as conspicuous in the human figure as in a Greek temple. The advantage of equilibrium which is subserved in the living, the locomotive body, does not need to be consulted quite in the same way in the building, but it effectuates there what is a great advantage, the expression of equilibrium, of solidity, and also of that concentration which is the very essence of unity of purpose and unity of effect. Under what circumstances this principle may be neglected in important buildings, and then how the departure from it needs to be qualified and compensated—these are important and interesting questions, but would need to be treated separately.

As regards the proportionate division of the erect human figure, one current system divides the full height equally at the *symphsis pubis*, and then the upper half again on the line of the nipples, and the lower likewise into equal parts just below the patella. But two of these lines have no functional or structural significance; for a proportionate division, either in nature or art, to be significant, it must lie between terms which are naturally and importantly antithetical; only so can it express an adjustment of quantities, which brings into orderly relation those parts and functions which in themselves present the greatest contrast, and which therefore, unless thus brought under regulated control, may not only appear but be liable to fall into antagonism instead of coöperation and concert, and so to bring the entirety to confusion.

What shall we say, then, are the leading contrasts which, from this point of view, present themselves in the aspect of the erect human frame? I would say two, chiefly. The first of these is between the compact and massive trunk on the one hand, and on the other, the free lower limbs below, and the head and neck above. In the typical figure, accordingly, which is all that we can deal with, I find that the proportion applicable here is the simplest of all, after equality, namely, one to two; that is, the proper trunk is one-third of the full height, or, let us say, two-sixths.

Then the lower extremities taken upon the natural line of the *symphysis pubis*, is half the full height, or three-sixths, and we have one-sixth left for the head and neck. Otherwise stated, the joint height of head and neck is as one, to the solid trunk as two, and to the free lower extremities as three.

But as I have said, the aspect of the erect human figure presents intimation of another antithetical juxtaposition of parts, and this is of such a nature as to seem to demand still more authoritatively a response in proportional adjustment.

When we contemplate the human form, at the same time that we are possessed with a lively sense of its varied relations, the same distinction among them naturally declares itself, which is traceable as pervading the philosophical reflections of Prince Hamlet. "Noble reason" and "infinite faculties" are correlative to "expressive and admirable form and movement" — the action as of an angel to apprehension as of a God. Even so, consciously or unconsciously — that is, whether we formulate the impression or not — impressed we are by the correlation of what, with no meaning of disparagement, may be called the servile division of the body to the noble division. Even those of us who may be least inclined to consider our bodies to be what, in any stricter sense, we mean by ourselves, will recognize the difference in question — a nearer relation of the intellectual, imaginative and moral functions of our nature, to the head and that upper part of the trunk which lodges lungs and heart — the organs most intimately concerned and associated with sensation, thought and emotion. There are vessels of honor and vessels comparatively of dishonor; vessels, certainly, of different grades of dignity. The organs which subserve digestion, growth and locomotion are so far in a different line to the immediate instruments of our highest endowments, from the organs of speech and the expressive features, to the all-accomplished hands. (See *Builder*, 1 November, 1884.)

The line which marks this division below the chest gives, normally, as I believe, to the nobler upper division exactly half the height which is assigned to the lower—the subject or inferior division of the marvellous organism. This primary division is, in fact, regulated by the same simple ratio of 2 : 1.

As the purpose of the present lecture is to clear ideas generally on the subject of proportion — its forms in the abstract, and then as predominant in all the arts as well as in architecture—and in Nature as well as in art and on common principles — it is not going beyond its prescribed range to indicate how the same adjustment of proportions, which admit of expression in the simple terms of the arithmetical series 1 : 2 : 3, are common to the human frame and to the very masterpiece of Gothic architecture.

"The perfection of proportion, as of many other things, was reached," says Ferguson, "in Westminster Abbey. Here the whole height of a bay is divided into two equal parts, and the upper subivided into three, of which one is allotted to the triforium, and two to the clerestory." Now it will be observed that in this distribution, as in the typical human body, we have an exact division of full height into halves, associated with a further subdivision of one-half, resulting in a triple division which follows the arithmetical series, 1, 2, 3. But the triforium, the front of the gallery over the aisles, in virtue of structural relation which is duly emphasized by continuous decoration, groups preferentially with the arcade below. The two form a compound term of comparison with the height of the clerestory, in the ratio 2 : 1. The height from the pavement to the string-course above the triforium is just double the height of the crowning member, the clerestory, which asserts its independent and conspicuously distinct office above. (*Builder, ibid*).

In the demarcation here of the terms which are brought into precise proportion to each other, there is the same natural propriety as in the corresponding comparison of the superior and inferior divisions of the human body, and, as we shall see in the next lecture, governed the proportional adjustments of the Greek architects.

I have thus endeavored to clear ideas as to the function of proportion both in nature and art, and to indicate its relation not to one single art, but to all the arts; to clear ideas, also, as to the nature of a proportionate scale, as subject to the natural conditions of each particular art, and as being in each the aid to imagination, not its master or its substitute.

As there is a science of sciences, so there is an art of arts; the subject matter of this consists of the principles which are common to all the arts, in virtue of participation in which they become truly sisters. Predominant among these principles is common dependence on proportion. It is largely by his sense and by his mastery of proportion that the practiser of any art becomes in the highest and noblest sense an artist. It is at this point, also, that Art most intimately joins hands with Science, and this conjunction is most definitely pronounced in the cases of Music and Architecture. The music of the ancients, as I have said, has perished; and we only know enough of it to assure us that what fragments of their treatises on the subject have come down to us, give no adequate account of either their theory or their practice. The reverse is the case with their architecture; not even a fragment of the Greek treatises on this remain, but in compensation we have noble remains of their works, which, thanks chiefly to the labors of the Society of Dilettanti, continued from a century since down to the present year, are explored and measured and placed upon permanent record. It is on

the basis of such record that I propose, in the next lecture, to set forth how an important outline of the theory of Ictinus, the architect of the Parthenon, may be recovered from his executed, however unhappily ruined, work. If I succeed in doing this, the attention which I have demanded for this preliminary lecture will surely not have been conceded in vain.

ARCHITECTS, CLIENTS AND BUILDERS.

IT is a principle of law and equity that an agent is not allowed to make any profit out of an agency without the knowledge and consent of his principal, beyond his proper remuneration; and any sums of money so obtained by the agent from any other source must be accounted for to the principal, who may claim it as money received to his use. Where, therefore, an engineer (and this case again refers equally to an architect) entered into a sub-contract with the contractor without the knowledge or consent of the employer, it was held that any surreptitious dealings between the contractor and the engineer was a fraud, and entitled the defrauded employer, if he came in time, to have the contract which was entered into without his knowledge or consent rescinded, and to refuse to proceed with it in any shape. So, on the other hand, the architect should not, without the knowledge of the builder, enter into a contract or engagement with the employer. If, besides the contract between the employer and the builder, there is a contract between the employer and the architect, not communicated to the builder, that the outlay shall not exceed a given sum, and the builder is, by the contract, subject to the orders of the architect as to what works he shall execute, this agreement is not binding on the builder, and such restriction of the architect's authority by contract, as agent for the employer, cannot in any respect prejudice the builder's rights.

And in order to enable the employer to claim the benefit of the proviso, that the architect was to arbitrate in all matters between him and the builder, it is essential that the fact of such a contract as above mentioned, between himself and the architect should have been communicated to the builder, and distinct notice of such an engagement given to him previously to his entering into any contract, as otherwise the architect would be put in a position of undue bias.

If however, the builder was aware of the agreement between the architect and his employer, and of the fact of the architect's interest in consequence, the builder would be bound.—*London Architect.*

SOCIETIES

WESTERN ASSOCIATION OF OHIO ARCHITECTS.

THE following Constitution and By-Laws were adopted by the Western Association of Ohio Architects at their convention held at Columbus, Ohio, January 12, 1886: —

NAME.— Section 1.— The name of this association shall be The Association of Ohio Architects.

OBJECTS.— Sec. II.— The objects of the association are: To unite in fellowship the architects of the State of Ohio, to combine their efforts so as to promote the artistic, scientific, and practical efficiency of the profession, and to cultivate and encourage the study of kindred arts.

MEMBERS.— Sec. III.— This association shall consist of associates and honorary members.

QUALIFICATIONS. — Sec. IV. — Any architect engaged in the legitimate practice of his profession in the State of Ohio may become a member of this association.

[Amendment I to the constitution of the Western Association of Architects is given in definition of Sec. IV of these by-laws.] The status of an architect is hereby defined as follows, to-wit: An architect is a professional man whose sole ostensible occupation consists in supplying all data preliminary to the material, construction and completion of buildings, in exercising administrative control over the operations of contractors, supplying material and labor incidental to the construction and completion of buildings, and in officiating as custodian and arbitrator of contracts, stipulating terms of obligations and fulfillment between proprietor and contractor.

OFFICERS.— Sec. V.— The officers of this association shall be a president, a secretary, a treasurer, five vice-presidents, and an executive committee.

DUTIES OF OFFICERS.— Sec. VI.— It shall be the duty of the president to preside at all meetings of the association; or, in his absence, this duty shall devolve on the vice-president present from the city where the meeting is held, or that nearest to the same.

It shall be the duty of the secretary to take minutes of all meetings of the association, and to conduct all of its correspondence, subject to the control of the Executive Committee.

It shall be the duty of the treasurer to collect all funds of the association, and disburse the same on the order of the secretary, when countersigned by the chairman of the Executive Committee.

The Executive Committee shall consist of five associates, including the president. It shall require three members of this committee to constitute a quorum.

It shall be their duty to exercise control over the property and general interests of the association; to receive nominations for membership and act upon the same; to consider complaints and expel members of the association for cause; to act as a committee of arbitration on all questions submitted to it by members of the association, and generally to have control of its welfare and interests.

All calls for extra meetings shall be issued by the committee.

This committee shall report to the association at each regular meeting of the association.

All appeals from the action of the Executive Committee shall be to the Board of Directors of the Western Association of Architects.

AMENDMENTS.— Sec. VII.— This constitution may be amended by a two-thirds vote of the association members present at any meeting of the association; provided, that a notice of such proposed change shall have been mailed to each associate by the secretary, on the order of the Executive Committee, twenty days before the date of said meeting.

BY-LAWS.

MEETINGS.— Article I.— The regular meetings of this association shall be semi-annually and occur on the third Thursday of January and July, unless otherwise ordered by the Executive Committee, thirty days' notice having been given, the place to be chosen at each preceding regular meeting.

RULES OF ORDER.— Art. II.— The meetings of this association shall be conducted according to Roberts's Rules of Order.

APPLICATION FOR MEMBERSHIP.— Art. III.— Any person desiring to become a member of the association shall send his application in writing to the Executive Committee, this application to be indorsed by two associates of the association who are personally acquainted with the applicant.

ELECTION OF MEMBERS.— Art. IV.— Upon receiving an application for membership the Executive Committee shall investigate the standing of the applicant, and shall, by ballot, admit or refuse him. All discussion of applicants to be considered confidential.

DUES.— Art. V.— All associates of the association shall pay an initiation fee of $10, and an annual due of $3. Dues to be paid semi-annually, and prior to each regular meeting, and no person shall be entitled to vote at any meeting whose dues remain unpaid.

QUORUM.— Art. VI.— Twelve associates shall constitute a quorum for the transaction of business.

ELECTION OF OFFICERS.— Art. VII.— All officers of the association shall be elected at first regular meeting of each year of the association. They shall be elected by a majority ballot vote of the members present. If any member of the Executive Committee is absent from four of its consecutive meetings, the other members shall have power to declare his place vacant, and proceed to elect his successor for the remainder of his term.

PAPERS AND RECORDS. — Art. VIII. — All papers and other records, not considered by the Executive Committee confidential, shall be at all times open to the inspection of the associates of the association.

AMENDMENT OF BY-LAWS.— Art. IX.— The by-laws of this association may be amended by a two-thirds vote of the associates present at any meeting, notice having been given as in the case of proposed amendments to the constitution.

The next semi-annual meeting of the association will be held at Cincinnati on the third Thursday of next July, when it is hoped all members of the association will be present.

PHILADELPHIA BOARD OF CITY TRUSTS.

AT a recent meeting of the Board of City Trusts, Secretary Highley reported that the number of students at Girard College on April 30, was 1,358. The April receipts were $38,843.87, and the expenses $7,384.43. The net income of the Board for this year is estimated at $133,399.81, as against $11,937.08 at the corresponding time last year.

A communication was read from John Wanamaker, Hood, Bonbright & Company, Strawbridge & Clothier, Edward T. Steel & Company, Joel J. Bailey, Henry C. Gibson, C. H. Garden & Company, Reigel, Scott & Company, Young, Smith, Field & Company, and Jenney & Andrews suggesting that a hotel be erected upon the lot bounded by Twelfth, Girard and Market streets and the new street laid out by the Board. Among other reasons that influenced the communication were that "the lot is 220 x 180 feet, each side of the quadrangle facing upon the street; is by situation, conformation and size most admirably adopted for a hotel site. It is central to business, churches, libraries and places of amusement. It is essentially the site for a travellers' hotel (rather than one of permanent residence for city people), as it is the only lot of sufficient size with the proper street facing now available or ever likely to be available for such a purpose in so central a quarter. The hotel accommodations in our city are far inferior to those of New York, Boston, or Chicago, and increased attractions are needed for travelers coming here from all parts of the country. It is an admitted fact that our hotel accommodations compare most unfavorably with those of other great commercial centres." In conclusion, the writers state that they will be glad to appear before the Board and present their views in detail. The subject was referred to an appropriate committee.— *Philadelphia Bulletin.*

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

PETROLEUM AS FUEL.

Pine Plains, N. Y., May 20, 1886.

To the Editors of the American Architect:—

Dear Sirs,— The enclosed item I clipped from some paper a little time ago.

Will you have the kindness to put me in communication with some party who can furnish the necessary apparatus to generate steam by the use of petroleum. Several persons here are interested in the matter and would like the necessary information.

Respectfully yours, A. Mattick.

[The National Heat and Light Company, 376 Atlantic Avenue, Boston, may possibly be able to give the information required, and several other parties have taken out patents relating to the subject, whose addresses some of our readers can perhaps give us. The Norway Iron Works, South Boston, Mass., have a petroleum puddling furnace, and may be able to supply information. The only application of the system on a small scale that we know of in this country was made by an amateur who fitted a petroleum spray burner to a cooking stove. It is said to work well, and to be odorless, but the fire admits of very little moderating. In Germany, as we understand, it is preferred to burn the oil without a wick. A tube, like that of an ordinary atomizer, dips nearly to the bottom of the oil receiver, the outer end being arranged to spray the oil. A portion of oil in the reservoir or elsewhere, is then heated so as to introduce vapor into the reservoir, the pressure of which forces out the oil through the spray tube. The preliminary heating of the oil to produce the pressure of vapor in the reservoir is due either by means of an auxiliary fire, or by pouring a little oil into a cup attached in some way to the reservoir, and furnished with a wick, and lighting it.—Eds. American Architect.]

NOTES AND CLIPPINGS

Accident to Elihu Vedder.— Elihu Vedder has met with a serious accident, which may end his work as an artist. The New York *World* says:—

He was engaged (in Rome) one evening in amusing his son upon the roof of his house. The two were flying a kite. The house next to Mr. Vedder's is several feet lower. Mr. Vedder, absorbed in flying the kite, walked off from the roof of his own house and fell to the lower one of his neighbor's. In this fall his entire weight was thrown upon his right hand. This resulted in breaking nearly all of the small bones of his hand. This was the most serious result of the fall. In recovering, these bones have knit together wrong, and the result is that they will have to be broken and reset, else his hand will be absolutely crippled for doing any more work. His left hand has been for some time disabled, so that it was of no use to him professionally. The result of the experiment of restoring Mr. Vedder's right hand to something like its original capacity by the surgeons will be awaited with great interest.

The Proposed Vermont Soldiers' Home.— The Trustees of the Vermont Soldiers' Home held a meeting at the Van Ness House May 11, to take action in regard to the location and erection of the proposed home. Gen. Wells of Burlington presided. The following propositions were made to the Trustees for the location of the Soldiers' Home: From Baxter Post of Newport, $500; from Col. John B. Mead of Randolph, a large boarding house, valued at $13,000; from the Trustees of the Norwich Classical and English Boarding School at Norwich, a brick building and grounds; from the town of St. Johnsbury, the sum of $5,000. Major Valentine of Bennington stated that the Hunt property, recently made over to the Trustees of the Park House by the heirs of the late Hon. T. W. Park, could doubtless be secured for the Home, provided its acquisition was deemed desirable. The Trustees reported the number of old soldiers in their respective counties who would probably avail themselves of the proposed home to be in all 77. Resolutions offered by Col. Fairbanks were unanimously adopted by the Trustees, stating that "in view of the reports which have been made from the various towns of the State in regard to the need for a Soldiers' Home we deem it wise to proceed at once, or as soon as may be, to establish a home under the provisions of the law." Gen. William Wells, ex-Gov. Redfield Proctor, Major Josiah Grout and Col. Julius J. Estey were appointed a committee to visit the various towns making propositions for the location of the Soldiers' Home. A resolution was also adopted authorizing the President and Secretary to call on the Treasurer of the State for the appropriation of $10,000 to be used in establishing a Soldiers' Home. Offers were made by the St. Johnsbury Woman's Relief Corps and Post W. C. Tracy of Windsor to furnish rooms in the Soldiers' Home when erected. The outlook for the location of the Home at an early day seems to be promising.—*Boston Journal.*

Dangers in the Improper Working of Mild Steel.—From a paper on the "Injurious Effect of a Blue Heat on Steel and Iron," by Mr. C. E. Storomeyer, Assoc. M. Inst. C. E., it appears that in the face of the many good qualities of mild steel and its liberal use in ship-building and boiler-construction, that many engineers considered it a treacherous material. Many instances were adduced in which it had failed unaccountably, in nearly all of which an examination seemed to prove the fact that the plates were subjected to bending or hammering while at a blue heat, or "black heat," the latter being the term applied by boiler-makers and blacksmiths. The author stated that steel which had been bent cold, either once or twice, would stand almost as many subsequent bends as the original test-pieces. But if the same material was bent once while blue-hot, it lost a great deal of its ductility. Out of twelve samples, in which two preliminary hot bends were made, nine broke with a single blow of a hammer, and the other three only stood one or two subsequent bends. Thin Lowmoor iron did not break quite so easily, but supported about one-half the original number of bends. The experiments all pointed to the great danger incurred if iron or steel were worked at a blue heat. The difference between good iron and mild steel seemed to be that iron broke more readily than steel while being bent; that iron suffered more permanent injury than steel by cold working, but that if it had successfully withstood bending when hot, there was little probability of its flying to pieces when cold, like mild steel. It is a common practice among boiler-makers to "take the chill out of a plate" if it required a little settling, or to set a flanged plate before it was cold. This was working it blue-hot, and should not be allowed. All hammering or bending of iron and steel should be avoided, unless they were either cold or red-hot. Where it is impossible to avoid working steel at a blue heat, it should be annealed afterward. It was satisfactory to learn that, since the introduction of mild steel, a practice had been gaining ground among boiler-makers which must have the effect of guarding against such failures, and should be encouraged. It consisted in the cessation of work as soon as a plate, which had been red-hot, became so cool that the mark produced by rubbing a hammer-handle or piece of wood over it would not glow. A plate which was not hot enough to produce this effect, yet too hot to be touched by hand, was most probably blue-hot, and should under no circumstances be hammered or bent. The theory that local heating of a plate set up strains which sometimes caused failures did not appear to be supported by the experiments. This is a matter for consideration by architects, steam engineers, and boiler-makers, now at a time when the first-mentioned are calling for steel boilers. It appears that the flange-turner by working the steel plates below a certain temperature may make them unsafe, say below 800° Fahrenheit, and that the habit of holding a mass of red-hot iron against a lap or part of a boiler to draw it up by hammering should be discontinued, as it is much safer — in the case of steel, at least — to draw it up cold if it cannot be made to fit red-hot. Heads of cylindrical boilers turned by machine, at one heating, with a long radius in the corner of the flanges, would, according to this, appear to be safer than one turned by short heats on a block.—*Sanitary Engineer.*

A Mandalay Monastery.—"There are two great religious edifices in Mandalay, which it is the duty as it is the pleasure of the traveller to see. The city, like all Burmah, teems with pagodas and temples. Every hilltop, every plain, every grove of trees, every garden has its graceful building in white or gold, giving evidence of the piety and of the lavishness of their innumerable founders. The amount of money thus expended during centuries, and now still lavished year by year, and month by month, is past the counting of all the clerks in the Bank of England. The roads, the palaces, the fortifications, the aqueducts, that might have been built with all this brick and mortar to say nothing of the stucco or the gold leaf, sometimes an inch thick! A chance fire burnt down one great pagoda, and the gold melted from its immense surface is said to have been worth sixty-five lakhs! It was replaced by Theebaw, and more gold added. This enormous waste of the national resources presevered in through generations may account for the manifest poverty of the population, which lives for the most part in habitations of wicker work eked out with matting. There is no accumulation of property; every family lives an ephemeral life, those that come after will live the same. The palace in Mandalay is composed of planks carved and gilt profusely indeed; but there is not a pucka wall to give consistence or permanence to a single wing of it. Three or four miles away the plinth of a pagoda was built by Mindo-Min with such an extravagant waste of solid material that even as it stands, it is said to be the greatest mass of brickwork in the world. An earthquake — nothing else would suffice — rent it, and the pagoda never was built on it. But there it remains. This was only one of the vast religious structures which marked that monarch's reign. In Mandalay itself he erected a monastery — the 'Like-of-which-there-is-not' — the Incomparable, which possesses a room unquestionably the finest in all Mandalay. It would be no great stretch of fancy to say it is the first in the world. The building is composed of a series of bold terraces, six in number, rising one above another, the central one being the highest. The golden room is carried on thirty-six pillars, some of which are seventy feet high, the ceiling reaching its greatest elevation in the high central terrace, under which is a colossal figure of Gautama beside a golden throne. The boldness of the general design, the noble proportions of the immense hall, and the great height attained over the throne and the statue fill the mind with surprise and pleasure. Pillars, walls, and ceiling are richly gilt, glass inlaying heightening the brilliancy. The Chief Commissioner has shown his appreciation of the beautiful in prescribing the Incomparable as the scene of the great ceremonial, if circumstances permit of its being held. Externally, the building is vast, but plain in design and material; the walls are white stucco, and severely plain. But the mass, bathed in the bright sunlight, is imposing in its simplicity. Not far from the Incomparable is a pagoda of great size and perfect symmetry, covered with gilding, and rising up among no less than 464 little chapels — if such they may be called — each containing a large tablet of white marble, on which is inscribed a portion of the sacred Buddhist books. Thus the whole of the law is displayed, cut in marble to the eyes of the inquirer. This pagoda, with its surrounding buildings, must have cost from twelve to fifteen lakhs. It bears the title of the Royal Merit — significant of the conviction indulged in by Mindo-Min that in building this great religious edifice, with its instructive surroundings, he had earned for himself the great reward, when the time should come, 'to reign among the spirits' (not to 'die' like an ordinary mortal). He would merit nirvana itself and have done with the sin and suffering of existence. King Theebaw, I hear, was engaged in constructing a magnificent building, to cost twenty-three lakhs, at some distance from Mandalay; a structure so vast as to establish his Royal merit beyond all doubt or cavil. But it will never be finished."—*The Bombay Gazette.*

THE AMERICAN ARCHITECT AND BUILDING NEWS. MAY 29, 1886. No. 544.

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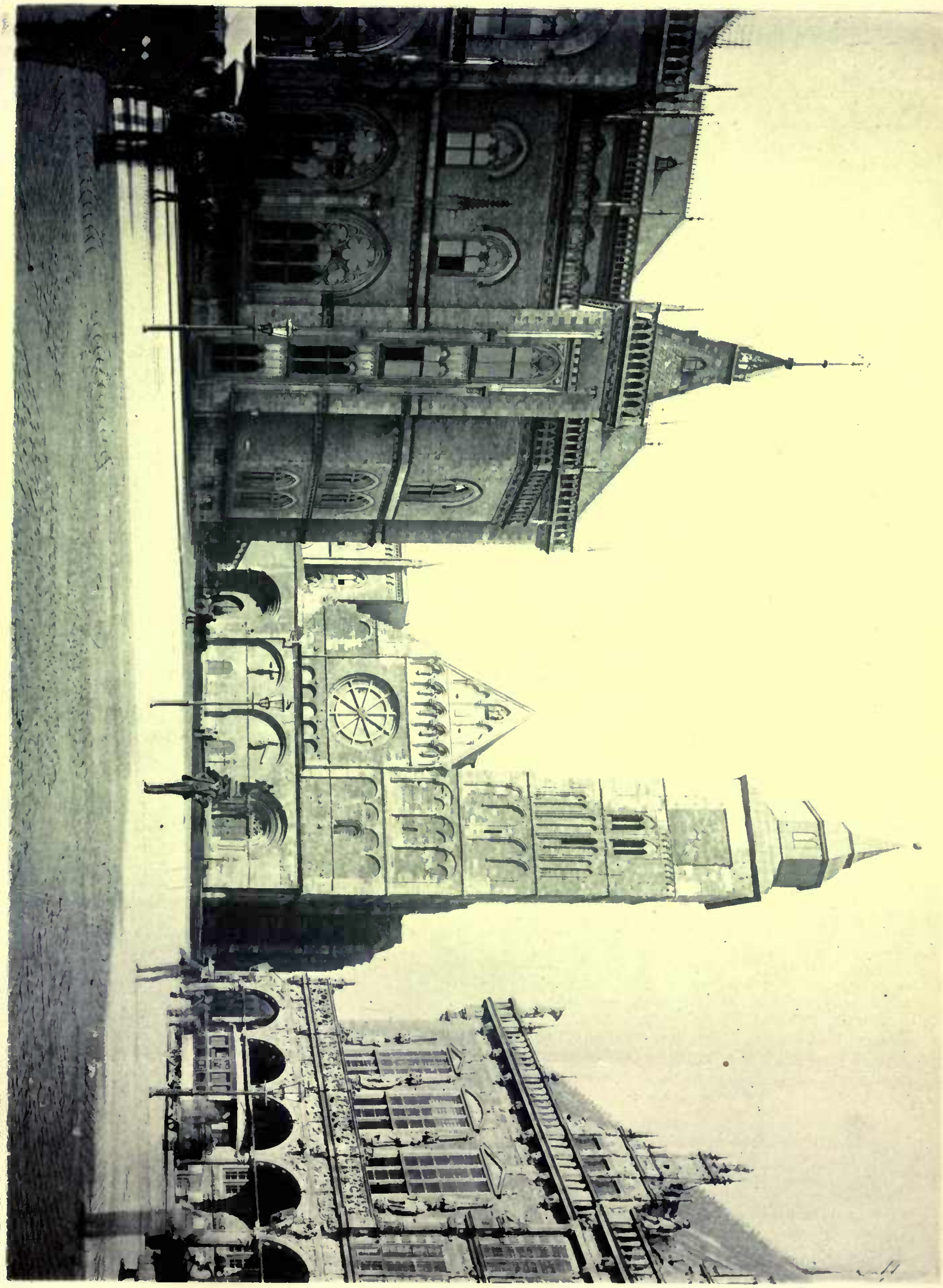


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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. No. 545.

Copyright, 1886, TICKNOR & COMPANY, Boston, Mass.

JUNE 5, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

WE suppose that the familiar and epigrammatic epitaph devised to perpetuate the fame of Sir Christopher Wren will recur to every one when he learns that the Boston Society of Architects is taking steps to secure the erection in Trinity Church, Boston, of a monument of a kind which shall fittingly do honor to the memory of the late Mr. Richardson. It is not yet determined what form shall be given to the memorial, but as the Society seeks to raise the sum of five thousand dollars in contributions from the architects and architectural societies throughout the country, we may expect that something will be done as worthy of the man as is the statue of George Edmund Street which was so short a time ago unveiled at the New Law Courts, London. Some have suggested that as the church was its architect's best monument, the proper thing was to aid in the completion of that structure, the west front of which still lacks the fine porch and other features which Mr. Richardson had lately designed; but as it appeared that Trinity Society was amply able to finish its own building, and is understood to be about to do so, this suggestion was abandoned, and the memorial will take a form more easily identified with its intention. We hope that the members of the profession will respond to the invitation freely, and forward their contributions, however modest, to the Treasurer of the Society, Mr. W. G. Preston, 186 Devonshire Street, Boston, or to any member of the following-named committee: Messrs. E. C. Cabot, R. S. Peabody, A. Rotch, R. D. Andrews, and E. M. Wheelwright. There is one point of some delicacy which must not be lost sight of in erecting such a memorial in such a place, and that is that though the building is always credited, and probably with perfect propriety, to Mr. Richardson, yet it was strictly the work of the firm Gambrell & Richardson, and we feel that Mr. Gambrell's advice and aid during the designing and construction of the building must have been such that this fact should be recognized in any memorial that may be erected in the building, that is, if the memorial is to associate the architect it commemorates with the building in which it is placed.

AS the question whether it is worth while for a woman to undertake to become a practising architect is one of general interest, we prefer to consider it here rather than give a specific opinion on the special case that has been referred to us, though this has some unusual features; for instance, the young woman was some time ago dissuaded from beginning her studies by the statement that the practice of architecture was arduous, and required a knowledge of, to her, unsuspected branches of science. Accordingly she was led to abandon her desire, and devote herself to the study of industrial and ornamental design, but the lapse of time has only served to convince her that her true vocation is to become an architect, if the limitations imposed by her sex, and the prohibitions of convention will permit. Apparently it is *une femme sérieuse* who seeks our advice, and in all soberness we counsel her to follow her bent, if, after having ascertained fully what things an architect must know and what bodily strain he has to endure, she still thinks herself fitted to enroll herself—a woman can sign herself an architect in this free country with as good right and title as any male house-milliner of us all — in the ranks of the profession. We hint at the limitations of physical strength only, as it is too late a day for any one to question the mental capacity of woman, in exceptional cases at least. We will only limit our recommendation by expressing the opinion that there are few women who can become, in the fullest sense of the word, *practising* architects as the word is understood by male practitioners, for the simple reason that they could not endure the strain. This can be in a manner proved by examining with some attention the architects of one's acquaintance, the chances being that the majority of them will be found to be men who have evidently found it impossible to keep themselves in good physical condition, and are evidently now working on such nerve force as is left to them, and then considering what would be the condition of the same number of female architects who would have begun their career already abundantly conscious of those nerves which the male architect only discovers after some years of the wear and tear of practice.

THE architects' ordinary work is unquestionably arduous, owing partly to its peculiarly complex nature, for it demands mental effort as exacting as that which falls to the engineer, imaginative effort such as is exercised by artists and designers of all kinds, the prevision of the thorough sanitarian — we hold that the architect and not the physician should be the real sanitarian — and the address of the accomplished man of affairs; to these must be added the capacity to endure the indoor confinement and physical strain that fall to the lot of draughtsmen of all kinds. But as there are few men who satisfy these requirements as they should be satisfied, and as, consequently, there are few architects in the fullest sense of the word, while there are many who are accepted as such though lacking in some of these particulars, so there is no reason why a woman should not perform some of the architect's duties as acceptably as most men, if she take care, as men, usually do, to supplement her own abilities by taking to herself a partner who is strong in those branches in which she knows herself to be weak. We know there are already a few women in this country who are practising architects, though we know nothing of the character of their work, or the amount of success they have achieved. It seems to us, however, that if woman is to gain a footing in the profession it will be necessary for the pioneers to be endowed with a higher degree of capacity than need be possessed by their successors, or by men who enter the profession at the same time with them, for it is by their prowess that the mandates of convention and the prejudice of centuries are to be overcome. To women of mediocre power and slight individuality we would say, wait till your more — shall we say—masculine sisters have prepared the way, if you expect to earn a livelihood.

BUT short of a full performance of an architect's duties there are possibilities of a woman's satisfactorily discharging enough of them to make it worth while for her to enter on a course of study. There are so many examples of women who have mastered mathematics and physics that there is no reason why women should not become good constructors and of value as such in any office. The increase of female physicians and the success they meet with certainly indicate that women may become able sanitarians. Women again, who are the founders and managers of large and successful businesses are common enough in any quarter of the world to indicate that they are capable of becoming competent advisers of and agents for the clients who may entrust them with commissions. But the field of design, particularly the designing of houses — the

peculiar stronghold of womankind, and interior decoration seem to promise women the best chance of exercising any architectural talent with which nature may have endowed them. In spite of all this we believe that architects who have had female assistants in their offices have found them, as a rule, unsatisfactory, because of a certain lack of conscience and fidelity growing out of an inability to appreciate the importance of little things and being at all times thorough; and we are so unfortunate as to believe that this peculiarity is so general a characteristic of the sex that it will require the efforts of consecutive generations of women before the world will believe that, other things being equal, it is as wordly wise to employ a woman as a man. The architectural departments of Cornell University and the Illinois Industrial University are open to women, and give diplomas in course, and the lectures at the Massachusetts Institute of Technology are also open to them, so there is certainly the opportunity to acquire the requisite training.

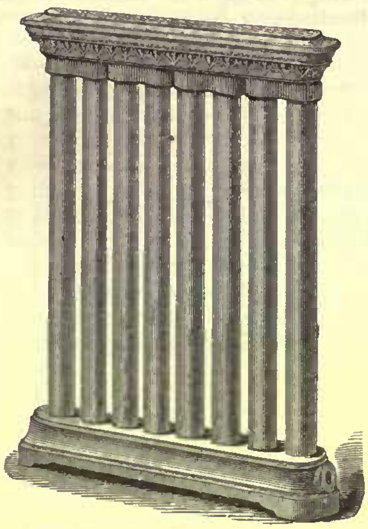
SELDOM has the old adage "out of sight out of mind" been proved a true one more disastrously — in a small way — than in the case of our competition for designs for a five-thousand-dollar house. It will be remembered that we undertook to have an estimate made by a trustworthy Boston builder for each design submitted, so that all designs might be measured by a common standard. Accordingly, we placed the fifty-one designs in the hands of a builder who, we knew, was in the habit of actually "figuring" his bids, and offered in payment the largest sum that we could afford. The builder took the drawings with the explicit understanding that he would figure on two or three of them at once, and if he so found that it would take more time than he could afford to spend he would return all to us immediately. As the drawings were not returned in a few days, we imagined that everything was in proper train, and conscious that estimates on fifty-one imaginary jobs were not to be expected at once we dismissed the matter — too effectually — from our minds. At length the matter occurred to us again, and we wrote to have the drawings and estimates sent in, when, to our chagrin and to the weakening of our faith in human nature, we at once received the drawings, but never a scrap of "figuring" or a word of explanation. Feeling that we were only too likely to be as unsuccessful with any other builder we might apply to, and that we had already kept the competitors in suspense longer than was proper, we have placed the drawings in the hands of the jury, and propose to publish them as soon as the award is made — unless we receive, meanwhile, so large a percentage of protests against abandoning the execution of our own suggestion as shall cause us to make another attempt to secure the desired estimates.

THERE seems to be a stirring of public opinion in Philadelphia just now towards securing one or more good hotels for that town. Everybody knows that they are sorely needed. The *Times* of recent date expresses the opinion that such a growth of business prosperity as Philadelphia has witnessed calls for and ought to insure a corresponding growth in hotel building. It thinks that there must soon be erected, within the territory bounded by Arch, Walnut, Thirteenth and Sixteenth Streets, two or three of the finest hotels in the country — buildings which shall be a credit to the city as well as a source of satisfaction to the residents and the travelling public. This may be so; but if the prediction is to come true, and if the Quaker City really desire to take a leading position in the matter and manner of hotels, she should take care that the external appearance of the new structures is in keeping with the elegance and completeness of their interiors. Take the hotels throughout the country, great and small, and how unattractive they are architecturally! The large structures, especially those that have sprung up almost in a day and a night, at the seashore and mountain resorts, are perhaps less pleasing to the æsthetic taste than those smaller and less pretentious. Nearly every city of size can show in its hotels a large measure of interior arrangements for comfort and pleasure, but the outside walls have been run up too often, with little regard for beauty or grace. They are mainly shells, so designed as to cover the requisite amount of space and afford the necessary number of rooms, leaving the idea of exterior charm wholly secondary, if indeed it enters into the plan at all. Look, for example, at one of the largest hotels in the country, one of the Saratoga group, and who can find any architectural beauty in it? There are some indications of a change in Boston hotel architecture: some of the apartment-hotels, more recently erected, are in the line of progress, and from descriptions of hotels for general use soon to be built, it appears that they are to be complete, outside as well as inside, and such as will be no discredit to modern architecture. We make our churches, our great public buildings, our smaller town-halls and our business places, as well as our private residences, beautiful. Is there any good reason why hotels should not be as attractive as stores, for instance? Why should not capitalists who put their money into hotel building seek to make them appeal to the eye of the traveller, as well as to his stomach? Will they always rely upon the excellence of interior appointments and good fare to attract patronage? Shall I not take more of "mine ease in mine own inn," if I am made to feel that it is good without as well as within? And will it not soon be found a good business investment to have the work of first-class architects upon the outside of hotels, with the understanding that the architects shall consider artistic exteriors one of the requirements in their work?

A RATHER interesting point was recently decided by the Massachusetts Supreme Court, on appeal from the court below. A furnace manufacturer placed two furnaces in a house under a stipulation which is becoming rather common in certain kinds of business, that they should remain the property of the dealer until paid for. The owner of the house in which the furnaces were set sold the house to a Mr. Way, without mentioning the fact that the furnaces did not belong to him, and the furnace-man brought suit against the new owner to recover either the furnaces, with the pipes and registers connected with them, or their value. The lower court ordered judgment for the defendant, on the ground that the furnaces were a part of the house, and passed with it to an innocent purchaser without regard to an argreement respecting them of which he was ignorant. The furnace-maker appealed, claiming that Mr. Way might have found out by inquiry that the furnaces did not belong to the former owner of the house, and that as he neglected to make any inquiries on the subject he was legally "affected with notice" of the fact which he might have learned. The full bench of the Supreme Court was called upon to consider the question, and decided that it "could not properly rule" that as the defendant made no inquiries he was affected with notice of what he might have found on inquiry, that the furnaces were the property of the plaintiff; and it further decided that it was "quite clear" that the furnaces and pipes claimed in the plaintiff's writ, which were put in as part of the house, and were essential to the enjoyment and use of them as dwelling-houses, were "annexed to and became a part of the realty, and passed to the defendant by his deed." The fact that there was an agreement between the former owner and the plaintiff that the furnaces should remain the property of the plaintiff until paid for was "immaterial unless the defendant had notice of such agreement, and notwithstanding such agreement the property annexed to the realty would pass to an innocent purchaser without notice.

THE *Sanitary Plumber* quotes from the Pittsburgh *Iron Review* an account of some experiments in regard to the comparative rapidity of transmission of heat through cast and wrought iron, which were made at the request of the Franklin Institute of Philadelphia, by a Pittsburgh iron manufacturer. The experiments made were very simple and resulted in showing that average cast-iron transmits heat more rapidly, by about ten per cent, than wrought iron of the same thickness. According to the experiments the laminated structure of wrought iron seems to check the passage of heat through it, and this appears not at all improbable. In fact, it has been asserted, perhaps as the result of observation, that steam radiators made of wrought-iron pipe purposely rolled very thin are considerably more efficient than those of pipe of the ordinary thickness, by reason, apparently, of the readier passage of heat through the thinner pipes; while it is usually thought, in using cast-iron pipes for hot-water radiation, as is the common way, that the thickness of the metal has no appreciable effect on the rapidity of transmission of heat through them. Whether any experiments have been tried to determine the comparative efficiency of wrought and cast steam radiators we do not know, but the result of such experiments would be both interesting and important to architects.

NOTES AND DATA ON RADIATORS, HOT-AIR PIPES AND REGISTERS FOR STEAM HEATING.—I.



Direct Rectangular Radiator.

THIS article has been prepared for the purpose of putting into practical form for the use of architects and those who have to do with steam-heating plants, such reliable information as the writer has been able to obtain from trustworthy works and experiments on the subject, and from his own experience and observation of the working of the steam-heating apparatus in many of the public buildings of Boston. The writer believes he has presented here nothing that may not safely be relied upon, but should this article call forth intelligent criticism he will feel that it has accomplished a two-fold object.

DEFINITIONS AND FUNDAMENTAL DATA. — CLASSES OF RADIATION.

Heating surfaces are divided into three classes; those affording: 1. Direct radiation. 2. Indirect radiation. 3. Direct-indirect radiation.

Direct Radiating Surfaces embrace all heaters placed within a room or building to warm the air already in the room.

Indirect Radiating Surfaces embrace all heating-surfaces placed outside the rooms to be heated, and should only be used in connection with some system of ventilation.

There are two distinct modes of indirect radiation, one where all the heating-surface is placed in a chamber and the warmed air distributed through air-ducts and impelled by a fan in the inlet or cold-air duct. The other, where the heating-surface is divided into many parts and placed near the lower ends of vertical flues leading to the rooms to be heated. The first mode has not, as a rule, proved a great success, although there are buildings that have been successfully heated in this way. The latter mode is the one most used, and if properly arranged is sure to prove a success.

Direct-Indirect Radiation is a mean between the other two methods. The radiators are placed in the rooms to be heated, as in the first method, to which a supply of fresh air is admitted from outside the building by means of registers placed back of the radiator. When the radiators are placed against an outside wall, and a casing is put around the back and top to force the air against the radiator, and an outlet is provided for the vitiated air, this method of heating will be found very satisfactory, and at the same time economical.

Measure of Heat.— The unit of heat (aside from that given by the thermometer) is known as the *thermal unit*, and, in Great Britain and in this country, is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Specific Heat.— To heat a pound of air at constant pressure one degree will require only 0.2377 as much heat as would be necessary to heat a pound of water one degree, or the specific heat of air is 0.2377.

A cubic foot of dry air at atmospheric pressure and at 60° Fahrenheit weighs 0.0764 pounds, hence, to raise one cubic foot of air at 60° one degree will require $0.0764 \times 0.2377 = .01816$ units of heat.

The condensation of a pound of steam to water gives out 966 thermal units. Hence, to determine the amount of heat given out by any radiator in a given time, it is only necessary to determine the amount of water in pounds which the radiator condenses in the same time and multiplying it by 966. With an ordinary boiler, properly set and with adequate draught and suitable proportions of heating-surface, one pound of anthracite coal of average quality will give out 9000 units of heat to the steam generated.

HEATING BY DIRECT RADIATION.

For warming rooms used for offices, stores, workshops, mills and places which are occupied by only a few people, or which may be ventilated by opening the windows, direct radiation affords a cheap and convenient mode of heating.

For rooms in which it is desirable that the heating apparatus shall present a neat appearance, and occupy as little space as possible, some form of upright radiator is generally employed. The most usual form is the pipe-radiator, of which a small one is shown in the inital cut.

These radiators are formed of a number of short, upright, one-inch tubes, from 2 feet 8 inches to 2 feet 10 inches long, screwed into a hollow, cast-iron base or box, and are either connected together in pairs by return bends at their upper ends, or else each tube stands singly with its upper end closed, and having a hoop-iron partition extending up inside it from the bottom to nearly the top. Of late years various forms of cast-iron radiators have been introduced for heating by direct radiation.

Figure 2 shows one of these patterns, known as the Bundy Radiator, manufactured by the A. A. Griffing Iron Company, of Jersey City. These radiators are extensively used throughout the United

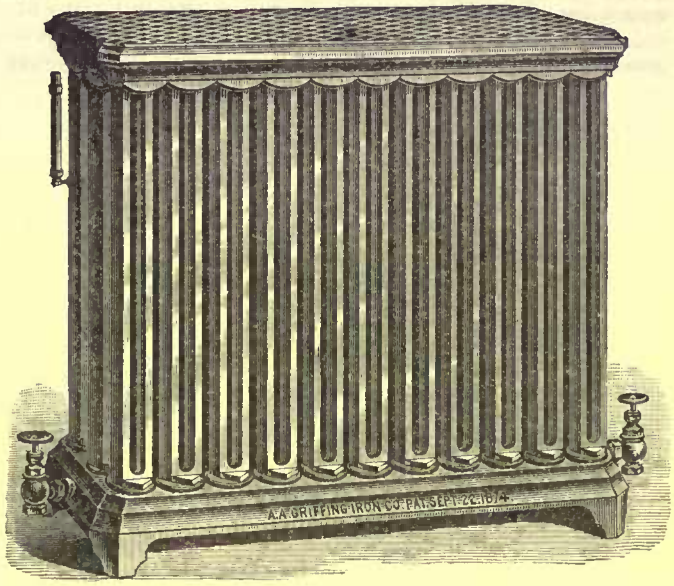


Fig. 2. Three-Row Bundy Radiator.

States, more especially in New York. The Walker & Pratt Manufacturing Company also manufacture a very similar radiator.

Figure 3 shows a form of extended-surface cast-iron radiator, manufactured by Ingalls & Kendriken, of Boston, which is largely in use in Massachusetts. Each manufacturer claims special advantages for the particular form of radiator which he manufactures. The pipe radiator seems to find as much favor as any, although it occupies more space for a given amount of heating-surface.

Regarding the *location of the radiators* in a room, it is generally recommended that they be placed against the outside-wall of the room, and preferably before or under the windows, if they can be so located without being in the way. For waiting-rooms in depots and stations, circular radiators placed in the centre of the room, and covered with a marble slab, are the most desirable. Where there are columns in the room, the radiator can be placed around one of them, and thus afford all the advantages of a radiator in the centre of the room, and without occupying valuable space.

Computation for the requisite amount of Heating Surface. — All radiators are measured by their heating-surface, or the amount of surface of the pipes which come in contact with the air. Therefore,

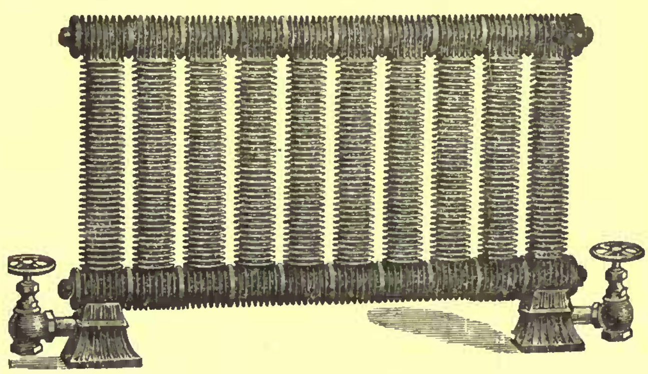


Fig. 3. Cast-iron Radiator.

to determine the size of radiators required to heat any given room it is necessary to determine the heating-surface, and divide this up among as many radiators as may be thought desirable.

The common practice is to allow one square foot of direct-radiating surface to a certain number of cubic feet of space to be warmed.

The following is the proportion of heating-surface for different classes of rooms, recommended by the engineer of the Walworth Manufacturing Company: —

For dwellings, cold or exposed rooms,	1 foot	heating-surface	to	50	cubic feet.
" ordinary rooms	1	"	"	65 or 70	"
" warm, sunny rooms	1	"	"	80	"
For churches and audience rooms	1	"	"	120 to 150	"
For factories and work-shops	1	"	"	200	"
For wholesale stores and warehouses	1	"	"	200	"

In deciding upon the proportion of radiating-surface to the cubic contents it should also be remembered that city houses require less heat than those in the country, and brick houses less than wood.

Mr. William J. Baldwin, in his excellent work on "*Steam Heating for Buildings*" gives the following rule for computing the direct radiating surface for keeping a room at the temperature of 70° with the temperature outside at zero: —

Rule.— Multiply the superficial area of the wall (including the windows), in square feet, by the number opposite the substance in Table I, and divide by 1000 (the value of glass). The product is

the equivalent of so many square feet of glass in cooling power. Divide the equivalent glass area by 2, and the result will be the square feet of radiating-surface required in a well-built building.

TABLE I.

SHOWING THE POWER OF TRANSMITTING HEAT OF VARIOUS BUILDING SUBSTANCES COMPARED WITH GLASS.

(*Baldwin's "Steam-Heating for Buildings."*)

Window-glass	1,000
Oak and walnut	66
White pine	80
Pitch pine	100
Lath and plaster	75 to 100
Common brick (rough)	120 to 130
" " (whitewashed)	125
Granite or slate	150
Sheet-iron	1030 to 1110

Example.—How many square feet of direct radiating surface should be placed in an office 15 feet by 20 feet, 12 feet high, with two windows, having 20 sq. ft. of glass each, and one pine door having 22 square feet.

Ans. — Cubic contents of room, $15 \times 20 \times 12 = 3600$ cubic feet; divide by 70, and we have 52 square feet. Or by Mr. Baldwin's rule: entire wall area equals $70 \times 12 = 840$ square feet. Take out glass and door surface, and we have: —

Lath and plaster,	77 square feet	×	75 =	58,350
Glass	40 " "	×	1000 =	40,000
Pine	22 " "	×	80 =	1,760
				100,110

Divide by 1,000 and then by 2, and we have 50 square feet for the heating surface.

Table II gives the number of tubes, heating-surface and dimensions of the regular patterns of pipe-radiator made by the Walworth Manufacturing Company, of Boston, Mass.

TABLE II.

RECTANGULAR PIPE RADIATORS THIRTY-FIVE INCHES HIGH.

No. of Tubes.	Surface. sq. ft.	Length. ft.	Length. in.	Width. in.	No. of Tubes.	Surface. sq. ft.	Length. ft.	Length. in.	Width. in.
ONE ROW OF TUBES.									
4	4		10¼	4¼	20	20	3	6¼	4¼
6	6	1	2¼	"	24	24	4	2¼	"
8	8	1	6¼	"	28	28	4	10¼	"
10	10	1	10¼	"	32	32	5	6¼	"
12	12	2	2¼	"	38	38	6	6¼	"
16	16	2	10¼	"					
TWO ROWS OF TUBES.									
8	8		10¼	6¼	36	36	3	2¼	6¼
12	12	1	2¼	"	40	40	3	6¼	"
16	16	1	6¼	"	48	48	4	2¼	"
20	20	1	10¼	"	56	56	4	10¼	"
24	24	2	2¼	"	64	64	5	6¼	"
28	28	2	6¼	"	76	76	6	6¼	"
32	32	2	10¼	"					
THREE ROWS OF TUBES.									
12	12		10¼	8¼	60	60	3	6¼	8¼
18	18	1	2¼	"	72	72	4	2¼	"
24	24	1	6¼	"	84	84	4	10¼	"
36	36	2	2¼	"	96	96	5	6¼	"
48	48	2	10¼	"	114	114	6	6¼	"
FOUR ROWS OF TUBES.									
16	16		10¼	10	80	80	3	6¼	10
32	32	1	6¼	"	96	96	4	2¼	"
48	48	2	2¼	"	112	112	4	10¼	"
64	64	2	10¼	"	128	128	5	6¼	"

CIRCULAR.

Heating surface.	Diameter. ft.	Diameter. in.	In halves to surround columns. Heating surface.	Diameter. ft.	Diameter. in.
18	1	1¾			
30	1	6½			
54	1	11½	56	2	2½
72	2	2½	80	2	4½
102	2	10¼	102	2	9½
130	3	2	130	3	2
160	3	2	160	3	2

When the appearance of a common radiator in a room is an objection, it can be cased by iron covers, so as to make it less unattractive in appearance. Figures 4 and 5 represent two patterns made by the A. A. Griffing Iron Co.

DIRECT-INDIRECT RADIATION.

The only difference between this method of heating and the direct method is that the radiators are directly supplied with fresh air, either by a register placed in the outside wall, or by means of a duct leading from the exterior air to the radiator. When this method is used, a hood should be placed against the back and over the top of the radiator, to force the air against the radiator, and then into the room. Ducts should also be provided to carry off the foul and heated air of the room. It is evident that fresh air cannot enter a room faster than the impure air leaves it.

In computing the heating-surface for direct-indirect radiation, about one-half more surface is allowed than for direct radiation.

INDIRECT RADIATION.

This is undoubtedly the best method of heating by steam, and at the same time the most expensive, although it is not so expensive but that it should be used for all schools, hospitals, audience-rooms, and any room occupied by a large number of people for any length of time. The principal rooms in dwellings should be heated by the indirect system when steam heat is employed. It is impossible to heat a room by this method without having some ventilation, as the fresh hot air coming into the room must by necessity force out the impure air. The best and most common method of arranging the heating apparatus for this method of heating is to locate the radiators in the basement, enclose them in galvanized-iron boxes, or wooden boxes



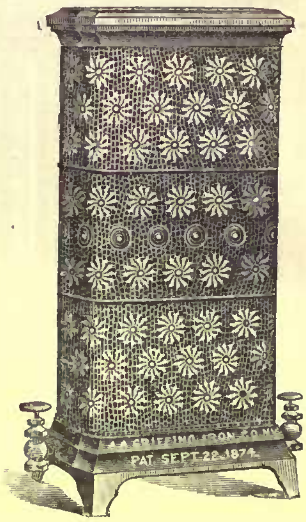


Fig. 4. Radiator-Screens. Fig. 5.

lined with tin, and connecting the boxes with registers, placed in the rooms to be heated, by round pipes either of tin or galvanized-iron. The radiators are supplied with pure air by pipes connecting the boxes enclosing them with the external atmosphere.

To secure satisfactory heating at each register it is essential that there should be a separate stack of radiators for each register; if two or more registers are supplied from one stack, the cold and wind may cause all the heat to go to one register, and none to the others.

The Radiators.—For indirect radiation, a form of radiator is employed different from those used for direct heating. In this method it is desirable to have as many feet of heating-surface in as little space as possible, and many different patterns have been devised for this purpose. The earliest form used, and which is still used to a great extent is the pipe-coil radiator, in which a coil of pipes connected at the ends with return bends, is used for the radiator. This gives a much larger surface for the same space than the vertical-pipe radiator, and can be easily made by any steam-fitter.

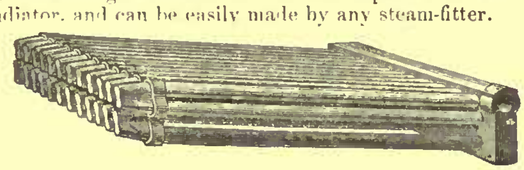


Fig. 6. Indirect Pipe Radiator.

Figure 6 represents an improved form of indirect pipe radiator made by the Walworth Manufacturing Company. The regular sizes of this radiator are as follows: —

No. of Tubes.	Square feet.	Length of base. ft.	Length of base. in.	Width of base. inches.
4 × 4	16		9½	7⅝
4 × 6	24	1	1½	"
4 × 8	32	1	5½	"
4 × 10	40	1	9½	"
4 × 12	48	2	1½	"
4 × 16	64	2	9½	"
4 × 20	80	3	5½	"
4 × 24	96	4	1½	"
4 × 28	112	4	9½	"

Figure 7 represents six sections of Gold's pin indirect radiator, manufactured by the H. B. Smith Co., Westfield, Mass. This is a

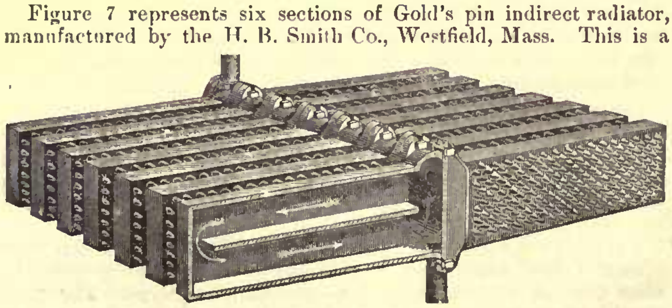


Fig. 7. Gold's Pin-Radiator.

cast-iron radiator, which is very extensively used throughout the country. As there is now no patent on this radiator, it is manufactured by many different companies.

The radiator as made by the H. B. Smith Co. is made in sections of nominally 10 square feet of heating-surface to a section, but actually 8.37 square feet. Each section is 6½ inches high, 41 inches long, and 3 inches wide, and contains 912 pins, each pin having a base of one-half inch, a top of one-fourth inch, and a length of eleven-sixteenths inches, the pins being in staggered rows, as shown in Figure 7.

To find the floor-space for any number of sections, allow three inches for the width of each section, plus one-half inch for each outside section, and the thickness of the box twice.

Figure 8 represents six sections of Clogston's patent cast-iron indirect radiator, manufactured by Ingalls & Kendricken, of Boston. Similar forms of radiators are used by other firms. This particular pattern is made in sections 42 inches long, 8 inches high at the centre, and 4½ inches wide, each section containing 16 square feet of heating-surface. The same firm also manufacture a smaller size of the same radiator, which is 30 inches long, 8 inches high, and 4½ inches wide, and contains 10 square feet of heating-surface. This radiator can also be used for hot-water heating. Each stock of indirect radiators should have a straightway valve in the supply and return pipes, and be supplied with an automatic air-valve, as shown in the cuts.

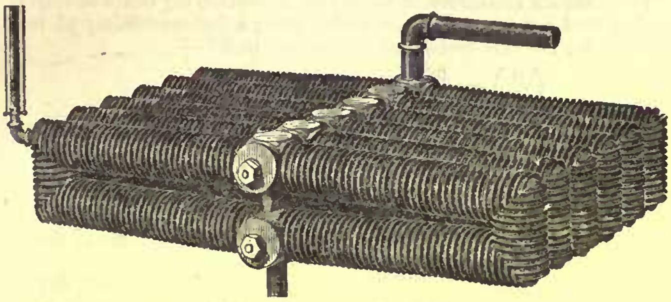


Fig. 8. Cast-iron Indirect Radiator.

RADIATOR CASINGS, HOT AND COLD AIR PIPES.

Whatever form of radiator is used, it should be encased in a box made either of No. 22 galvanized-iron, or of pine, lined with tin or zinc on the inside. Galvanized-iron is the material most generally used in Boston.

The size of the box should be such as to allow a clear space of 8 inches in height above and below the radiator. The length and width of the box should be only large enough to contain the radiator; if there is any space at either side or end of the radiator, a strip of iron should be riveted to the box, so as to close the space, that no air can pass from the bottom to the top of the box without passing through the radiator.

Each casing should be provided with either a hinged or sliding door opening into the space under the radiator.

Cold-Air Pipes.—Fresh air should be supplied to the radiator casings, through pipes of iron, tin or wood, connecting with the space under the radiator. When possible, it is best that the cold-air pipe should enter the bottom of the box. The pipe should be of sufficient size to supply all the air required, and should contain a damper for regulating the supply if desired. The opening in the exterior wall should be covered by wire netting.

The Hot-Air Pipes, are generally round tin pipes, running from the upper portion of the radiator casing to the registers in the rooms above.

The hot-air pipes should start as nearly opposite the point where the cold-air enters, as is practical, and should be a size larger than the cold-air pipes.

Figure 9 shows the ordinary casing for Gold's pin-radiator, with the exception that the pipes are generally made round, and there should always be a door on the side of the casing.

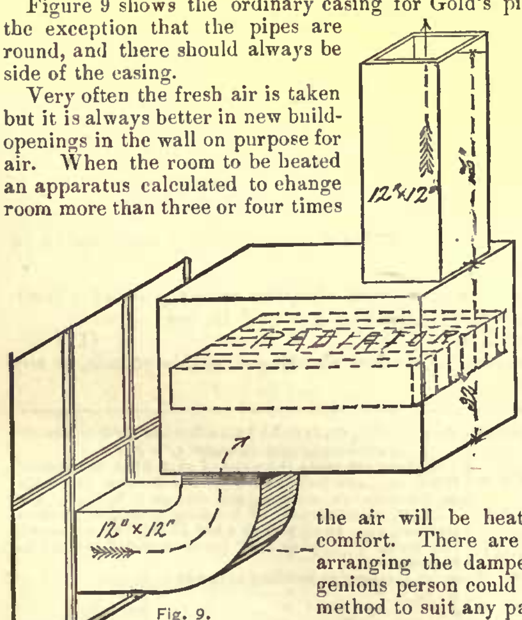


Fig. 9.

Very often the fresh air is taken from a window, but it is always better in new buildings to leave openings in the wall on purpose for supplying fresh air. When the room to be heated is ventilated by an apparatus calculated to change the air in the room more than three or four times an hour, a damper arrangement should be provided which will allow the fresh air to enter the warm-air pipes without passing through the radiator, otherwise in moderately cold days, the air will be heated too hot for comfort. There are various ways of arranging the dampers, and any ingenious person could readily devise a method to suit any particular case.

Figure 10 shows a very ingenious method employed in the Cambridge Hospital, Cambridge, Mass., Mr. W. E. Chamberlain, of Boston, architect. [A description of the heating of this building may be found in No. 8, Vol. 13, of the *Sanitary Engineer*].

The fresh air enters by the pipe A, and in cold weather enters the bottom of the box, the damper D being raised. The hot air ascends through the pipe H. When the room above is too warm, the damper D is lowered, and the fresh air passes over the radiator, and enters the hot-air pipe, without being heated. As the damper can be opened any desired amount, the amount of unwarmed air entering the room can be regulated at will. This insures a constant supply of fresh air, at any temperature desired.

The upper end of the damper is connected by a chain with a pull-and-stop mechanism within the room heated, so that the attendant can regulate the heat of the air without leaving the room.

POSITION OF THE REGISTERS.

Where possible the hot-air registers should be placed in one of the inside walls of a room, either just above the floor, or at a height of six feet or more. The writer has found that when a room is heated by two stocks of radiators, a very good result is obtained by having the two warm-air registers on one of the inner sides, just above the floor, and the foul-air registers on the opposite side at the same level.

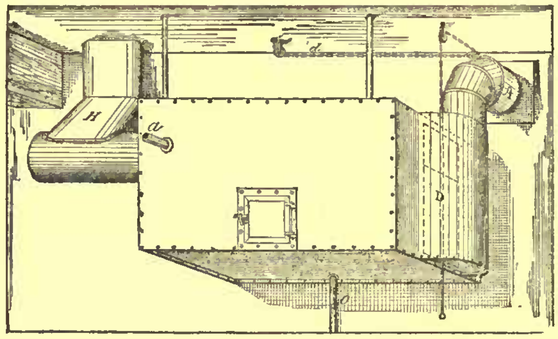


Fig. 10.

Mr. W. R. Briggs, architect, designed a high school-house in Bridgeport, Conn., in which the warm air entered the room through a register placed in one of the inner corners of the room 8 feet above the floor. The outgoing flue was placed directly under the platform, which is located in the same corner as the introduction flue. It was found that the hot air followed along on the ceiling, down the outer walls where it was cooled, and then back to the foul-air outlet under the platform.

In hospital wards, the prevailing method of ventilation is to place the warm-air registers in the walls under the window, and the foul-air registers in the floor nuder the beds. F. E. KIDDER.

[To be continued.]

SAFE BUILDING.—IV.[1]

SHEARING.

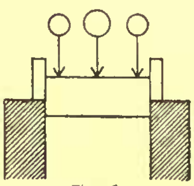


Fig. 6.

IN compression the fibres are shortened by squeezing; in tension they are elongated by pulling. In shearing, however, the fibres are not disturbed in their individualities, but slide past each other.

When this sliding takes place across the grain of the fibres, the action of shearing is more like cutting across. When this sliding takes place along the grain, the action of shearing is more like splitting. Thus, if a very deep, but thin, beam is of short span and heavily loaded, it might not break transversely, nor deflect excessively, but shear off at the supports, as shown in Figure 6, the action of the loads and supports being like a large cutting-machine, the weights cutting off the central part of beam and forcing it downwards past the support. This would be shearing across the grain.

If the foot of a main rafter is toed-in to the end of a tie-beam, and the foot forces its way outwardly, pushing away the block or part of tie-beam resisting it (splitting it out as it were), this would be shearing along the grain.

In most cases (*except in transverse strains*) the load is directly applied to the point being sheared off; the strain will, therefore, just equal the load, and we have:—

$$s = w.$$

Where $s =$ the amount of the shearing strain.
" $w =$ " load.

The stress will be equal to the area of cross-section (affected by the shearing strain) multiplied by the amount of resistance to separation from each other that its fibres are capable of.

This amount of resistance is found by tests and experiments, and is given for each material per square inch of cross-section. A table of constants for resistance to shearing of different materials will be given later; in the formulæ these constants are represented by the letter g for shearing across the grain, and g_1 for shearing along the grain.

We have, then, for the stress:—

$$v = a. \ g.$$

Where $v =$ the amount of ultimate stress.
Where $a =$ the area of cross-section in square inches.
Where $g =$ the ultimate resistance to shearing across the grain per square inch.

Therefore, the fundamental formula (1) $v = s. f$, becomes for pieces under shearing strains across the grain:—

[1] Continued from page 212, No. 540.

$$a.\, g = w.\, f, \text{ or :—}$$

$$w = a.\left(\frac{g}{f}\right) \qquad (7)$$

And similarly, of course, we shall find :—

$$w = a.\left(\frac{g_1}{f}\right) \qquad (8)$$

Where $w =$ the safe-load.

Where $a =$ the area of cross-section in square inches, at the point where there is danger of shearing.

Where $\left(\frac{g}{f}\right) =$ the safe-resistance to shearing *across* the fibres per square inch.

Where $\left(\frac{g_1}{f}\right) =$ the safe-resistance to shearing *along* the fibres per square inch.

Example.

At the lower end of a vertical wrought-iron flat bar is suspended a load of eight thousand pounds. The bar is in two lengths, riveted together with one rivet. What diameter should the rivet be?

The strain on the rivet will, of course, be a shearing strain across the grain, and will be equal to the amount of tension on the bar, which we know is equal to the load. We use Formula (7), and have :—

$w = 8000$ pounds.

The safe shearing for wrought-iron is about ten thousand pounds per square inch; inserting this in formula, we have :—

$$8000 = a.\ 10000, \text{ or } a. = \frac{8000}{10000} = \tfrac{4}{5}.$$

The area of rivet must, therefore, be four-fifths of a square inch. To obtain diameter, we know that :—

$$d = \sqrt{\tfrac{14}{11}.a} = \sqrt{\tfrac{14}{11}.\tfrac{4}{5}} = \sqrt{\tfrac{56}{55}} = \sqrt{1{,}01818}$$

This is, practically, equal to one; therefore, the diameter of rivet should be 1″.

In transverse strains the (vertical) cross-shearing is generally not equal to the load, but varies at different points of the beam or canti-lever. The manner of calculating transverse strains, however, allows for straining only the edges (extreme fibres) up to the maximum; so that the intermediate fibres, not being so severely tested, generally have a sufficient margin of unstrained strength left to more than off-set the shearing strain. In solid beams it can, therefore, as a rule, be overlooked, except at the points of support. (In plate-girders it must be calculated at the different points where weights are applied.) The amount of the shearing at each support is equal to the amount of load coming on or carried by the support.

We must, therefore, substitute for w in Formula (7) either p or q, as the case may be, and have at the left-hand end of beam for the safe resistance to shearing :—

$$p = a.\left(\frac{g}{f}\right) \qquad (9)$$

And at the right-hand end of beam :—

$$q = a.\left(\frac{g}{f}\right) \qquad (10)$$

Where $p =$ the amount of load, in pounds, carried on the left-hand support.

Where $q =$ the amount of load, in pounds, carried on the right-hand support.

Where $a =$ the area of cross-section, in inches, at the respective support.

Where $\left(\frac{g}{f}\right) =$ the safe resistance, per square inch, to cross-shearing.

Example.

A spruce beam of 5′ clear span is 24″ deep and 3″ wide; how much uniform load will it carry safely to avoid the danger of shearing off at either point of support?

The beam being uniformly loaded, the supports will each carry one-half of the load; if, therefore, we find the safe resistance to shearing at either support, we need only double it to get the safe load (instead of calculating for the other support, too, and adding the results).

Let us take the left-hand support. From Formula (9) we have :—

$$p = a.\left(\frac{g}{f}\right)$$

Now, we know that $a = 24.\,3 = 72$ square inches.

The ultimate resistance of spruce to cross-shearing is about thirty-six hundred pounds per square inch; using a factor-of-safety of ten, we have for the safe resistance per square inch :—

$$\left(\frac{g}{f}\right) = \frac{3600}{10} = 360 \text{ pounds.}$$

We have, now :—

$p = 72.360 = 25920$ pounds.

Similarly, we should have found for the right-hand support :—

$q = 25920$ pounds. And as :—

$u = p + q = 51840$ pounds,

that will, of course, be the safe uniform load, so far as danger of shearing is concerned.

The beam must also be calculated for transverse strength, deflection and lateral flexure, before we can consider it entirely safe. These will be taken up later on.

Should it be desired to find the amount of vertical shearing strain x at any point of a beam, other than at the points of support, use :—

$$x = \left\{\begin{matrix} p \\ \text{or} \\ q \end{matrix}\right\} - \Sigma w \qquad (11)$$

Where $x =$ the amount of vertical shearing strain, in pounds, at any point of a beam.

Where $\left\{\begin{matrix} p \\ \text{or} \\ q \end{matrix}\right\} =$ the reaction, in pounds, (that is, the share of the total loads carried) at the *nearer* support to the point.

Where $\Sigma w =$ the sum of all loads, in pounds, between said *nearer* support and the point.

When x is found, insert it in place of w, in Formula (7), in order to calculate the strength of beam necessary at that point to resist the shearing.

Example.

A spruce beam, 20′ long, and 8″ deep, carries a uniform load of one hundred pounds per running foot. What should be the thickness of beam 5′ from either support, to resist safely vertical shearing?

Each support will carry one-half the total load; that is, one thousand pounds; so that we have for Formula (11) :—

$$\left\{\begin{matrix} p \\ \text{or} \\ q \end{matrix}\right\} = 1000 \text{ pounds.}$$

The sum of all loads between the nearer support and a point 5′ from support will be :—

$\Sigma w = 5.\ 100 = 500$ pounds.

Therefore, the amount of shearing at the point 5′ from support will be :—

$x = 1000 - 500 = 500$ pounds.

Inserting this in Formula (7) we have :—

$$500 = a.\left(\frac{g}{f}\right), \text{ or, } a = \frac{500}{\left(\frac{g}{f}\right)}$$

We have just found that for spruce,

$$\left(\frac{g}{f}\right) = 360 \text{ pounds.}$$

Therefore, $a = \dfrac{500}{360} = 1{,}39$ square inches.

And, as $b.\ d = a$, or $b = \dfrac{a}{d}$, we have, $b = \dfrac{1{,}39}{8} = \dfrac{1''}{6}$

This is such a small amount that it can be entirely neglected in an 8″ wooden beam.

To find the amount of vertical shearing at any point of a canti-lever, other than at the point where it is built in, use :—

$$x = \Sigma w \qquad (12)$$

Where x the amount of vertical shearing strain, in pounds, at any point of canti-lever.

GLOSSARY OF SYMBOLS.—The following letters, *in all cases*, will be found to express the same meaning, *unless distinctly otherwise stated*, viz.:—

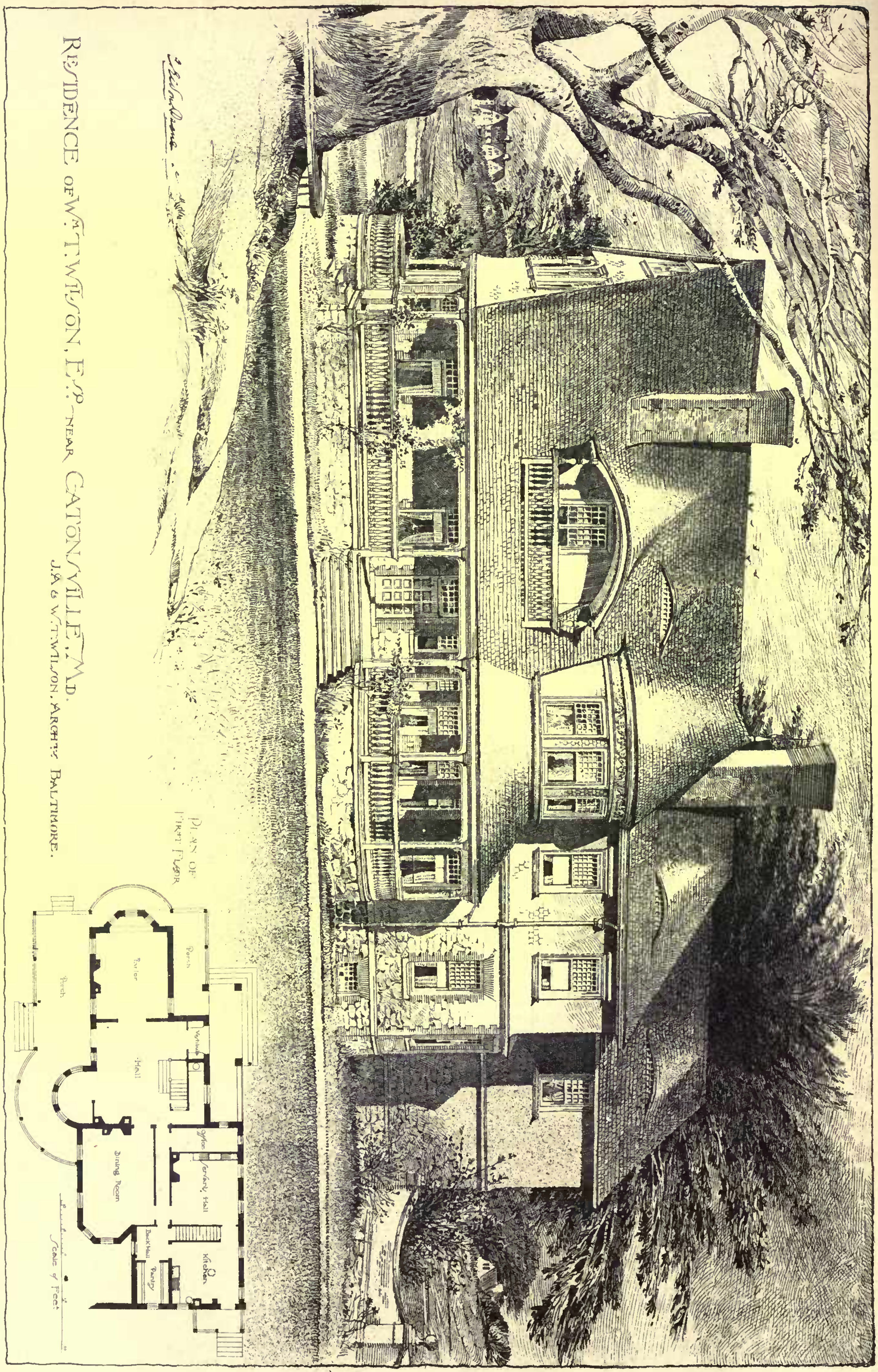
a = *area*, in square inches.
b = *breadth*, in inches.
c = constant for *ultimate resistance to compression*, in pounds, per square inch.
d = *depth*, in inches.
e = constant for *modulus of elasticity*, in pounds-inch, that is, pounds per square inch.
f = *factor-of-safety*.
g = constant for *ultimate resistance to shearing*, per square inch, across the grain.
g_1 = constant for *ultimate resistance to shearing*, per square inch, lengthwise of the grain.
h = *height*, in inches.
i = *moment of inertia*, in inches. [See Table I.]
k = *ultimate modulus of rupture*, in pounds, per square inch.
l = *length*, in inches.
m = *moment or bending moment*, in pounds-inch.
n = *constant* in Rankine's formula for compression of long pillars. [See Table I.]
o = the *centre*.
p = the *amount* of the *left-hand re-action* (or support) of beams, in pounds.
q = the *amount* of the *right-hand re-action* (or support) of beams, in pounds.
r = *moment of resistance*, in inches. [See Table I.]
s = *strain*, in pounds.
t = constant for *ultimate resistance to tension*, in pounds, per square inch.
u = *uniform load*, in pounds.
v = *stress*, in pounds.
w = *load at centre*, in pounds.
x, y and z signify *unknown quantities*, either in pounds or inches.
δ = *total deflection*, in inches.
ρ^2 = *square of the radius of gyration*, in inches. [See Table I.]
𝔡 *diameter*, in inches.
𝔯 = *radius*, in inches.
π = 3.14159, or, say, 3.1-7 signifies the *ratio of the circumference and diameter of a circle*.

If there are more than one of each kind, the second, third, etc., are indicated with the Roman numerals, as, for instance, a, a_{I}, a_{II}, a_{III}, etc., or b, b_{I}, b_{II}, b_{III}, etc.

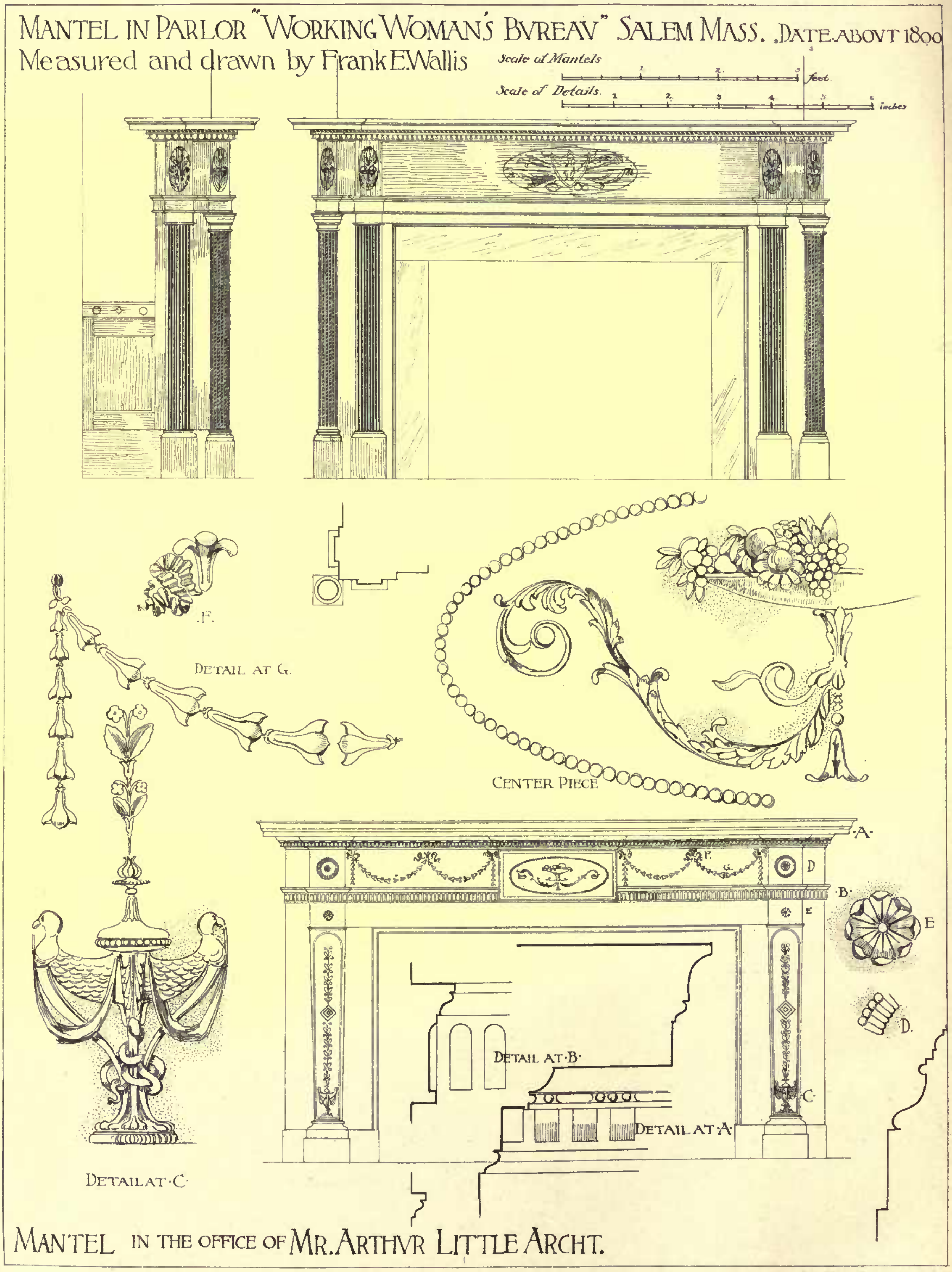
In taking moments, or bending moments, strains, stresses, etc., to signify at what point they are taken, the letter signifying that point is added, as, for instance :—

m = moment or bending moment at *centre*.
m_A = " " " *point A.*
m_B = " " " *point B.*
m_X = " " " *point X.*
s = strain at *centre*.
s_B = " *point B.*
s_X = " *point X.*
v = stress at *centre*.
v_D = " *point D.*
v_X = " *point X.*
w = load at *centre*.
w_A = " *point A.*

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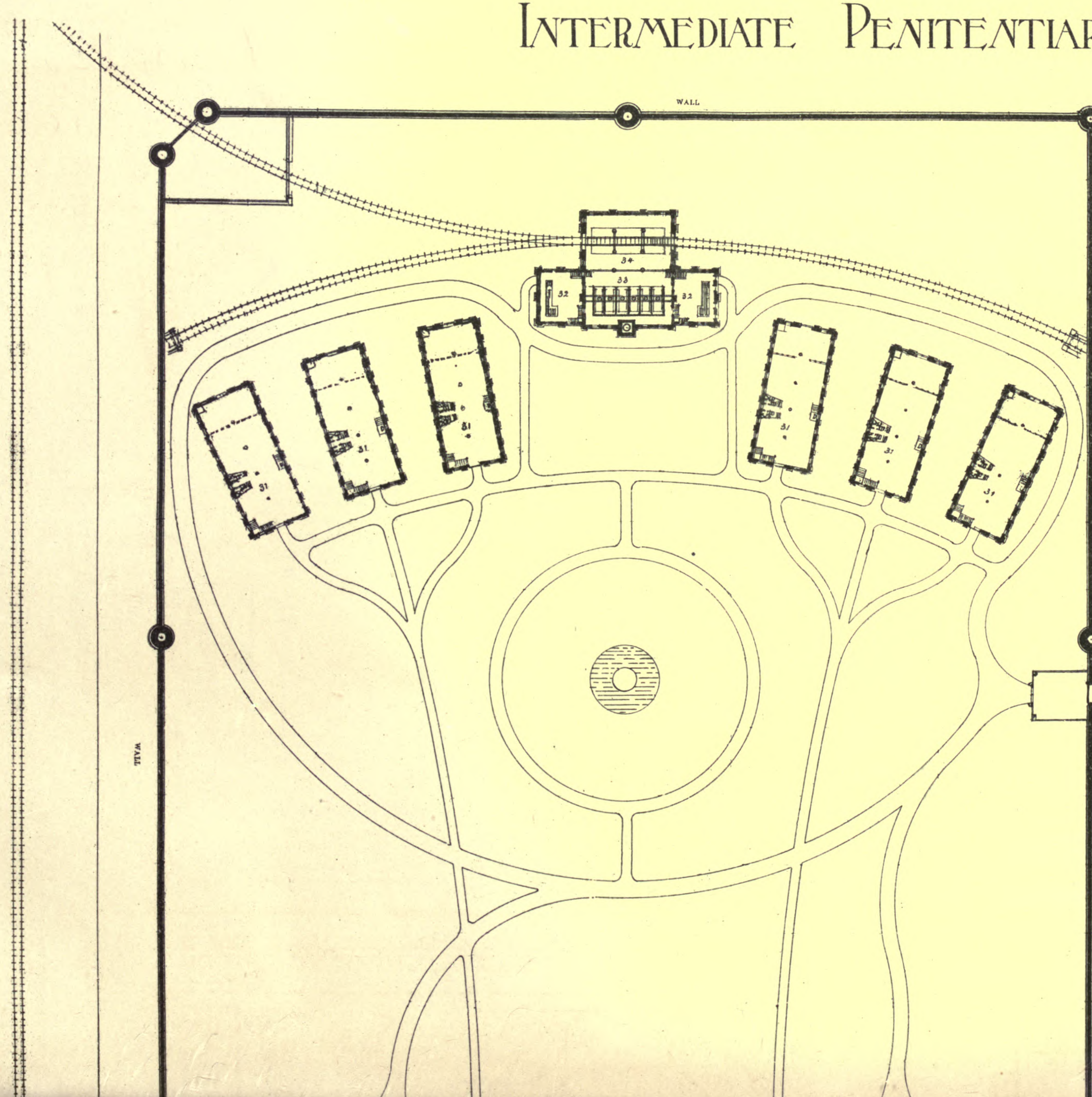
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OLD COLONIAL WORK, VIII.

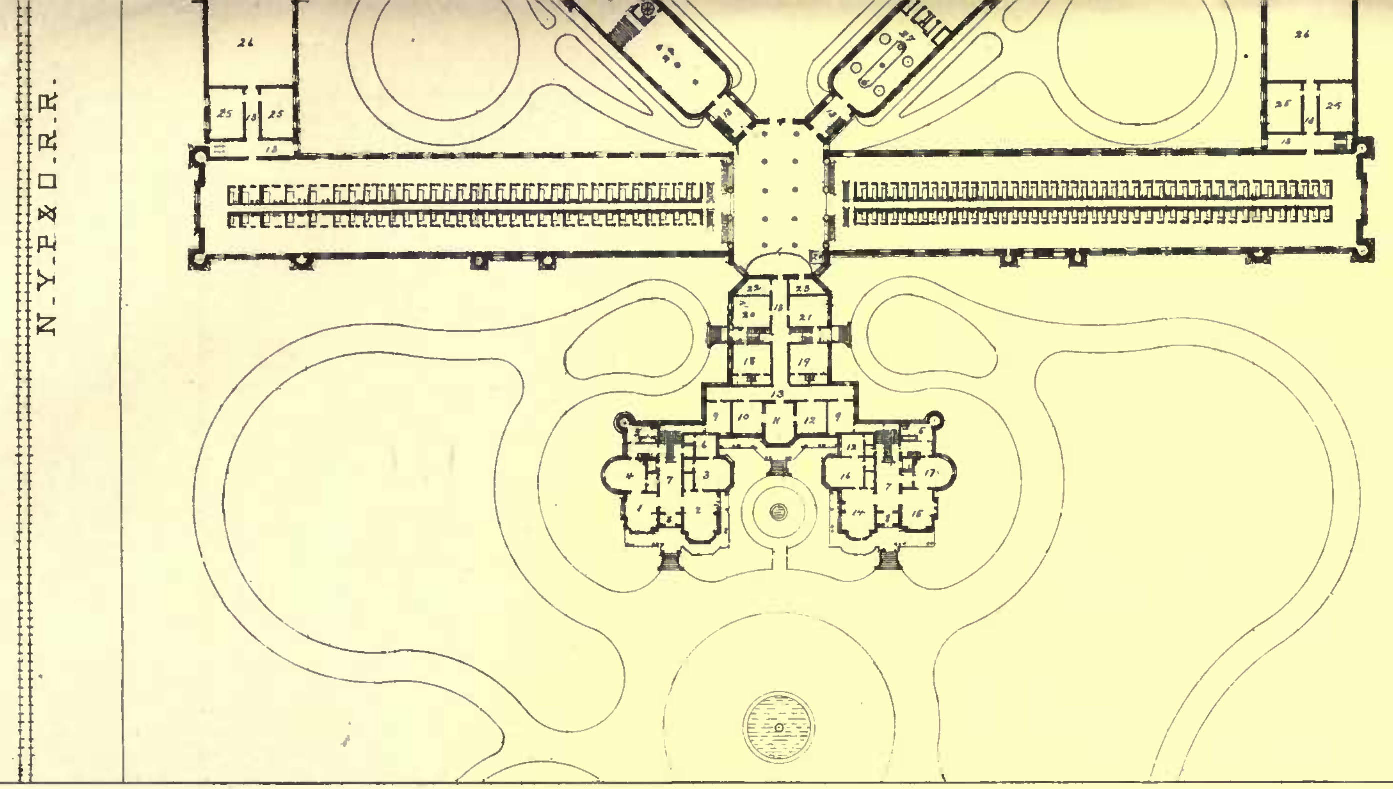
American Architect and Building News, June. 5 1886.

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Intermediate Penitentiary, Mansfield, Ohio.

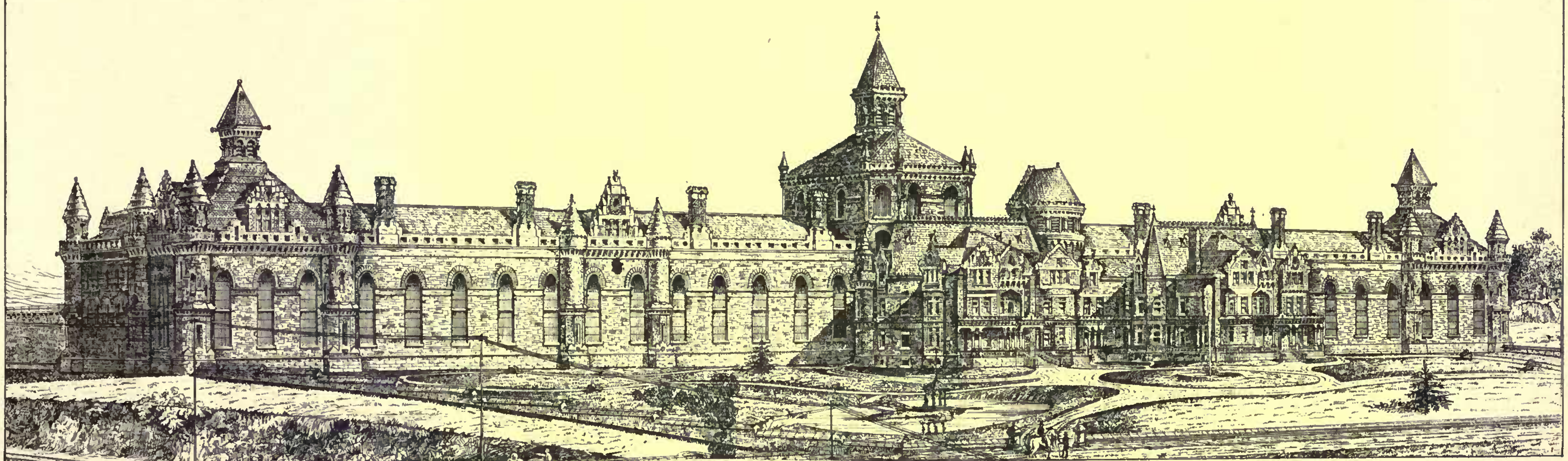


1 Managers' Room & Warden's Office.
2 Reception Room.
3 Book Keepers.
4 Private Office.
5 Toilet Room.
6 Records.
7 Main Hall.
8 Vestibule.
9 Ante.
10 Officers' Sitting Room.
11 ,, Dining ,,
12 ,, Serving ,,
13 Passageways.
14 Warden's Sitting Room.
15 ,, Parlor.
16 ,, Dining ,,
17 ,, Library.
18 Deputy Warden's Office.
19 Warden's Examination Room.
20 Clothing Room.
21 Store ,,
22 Guard's Sleeping Room.
23 Armory.



26 Teacher's Room.
27 Kitchen.
28 Bakery.
29 Folding Room.
30 Laundry.
31 Work Shop.
32 Engine Rooms.
33 Boiler ,,
34 Coal Depot.

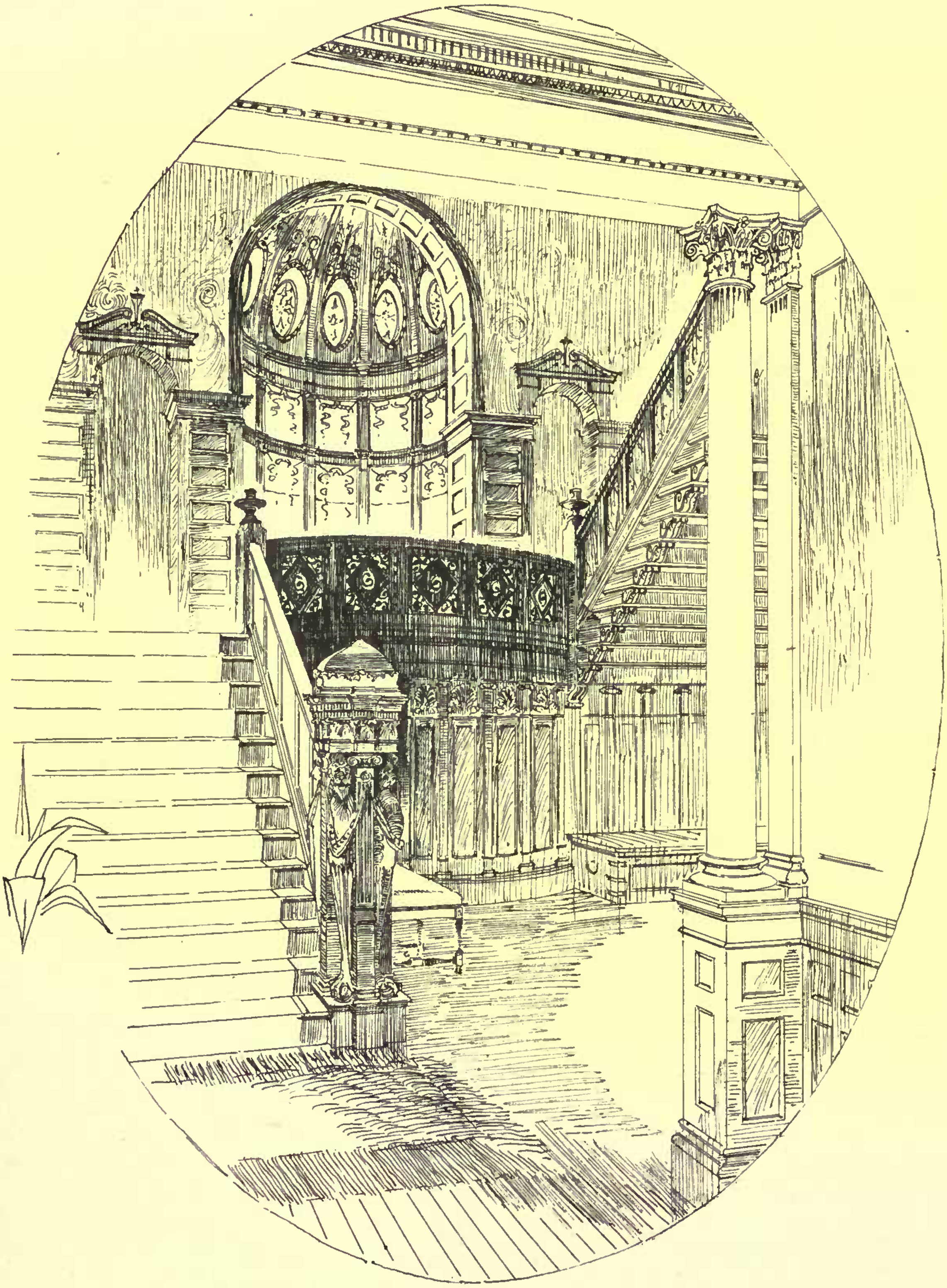
Levi T. Scofield. Architect,
Cleveland, O.



The Heliotype Printing Co. Boston.

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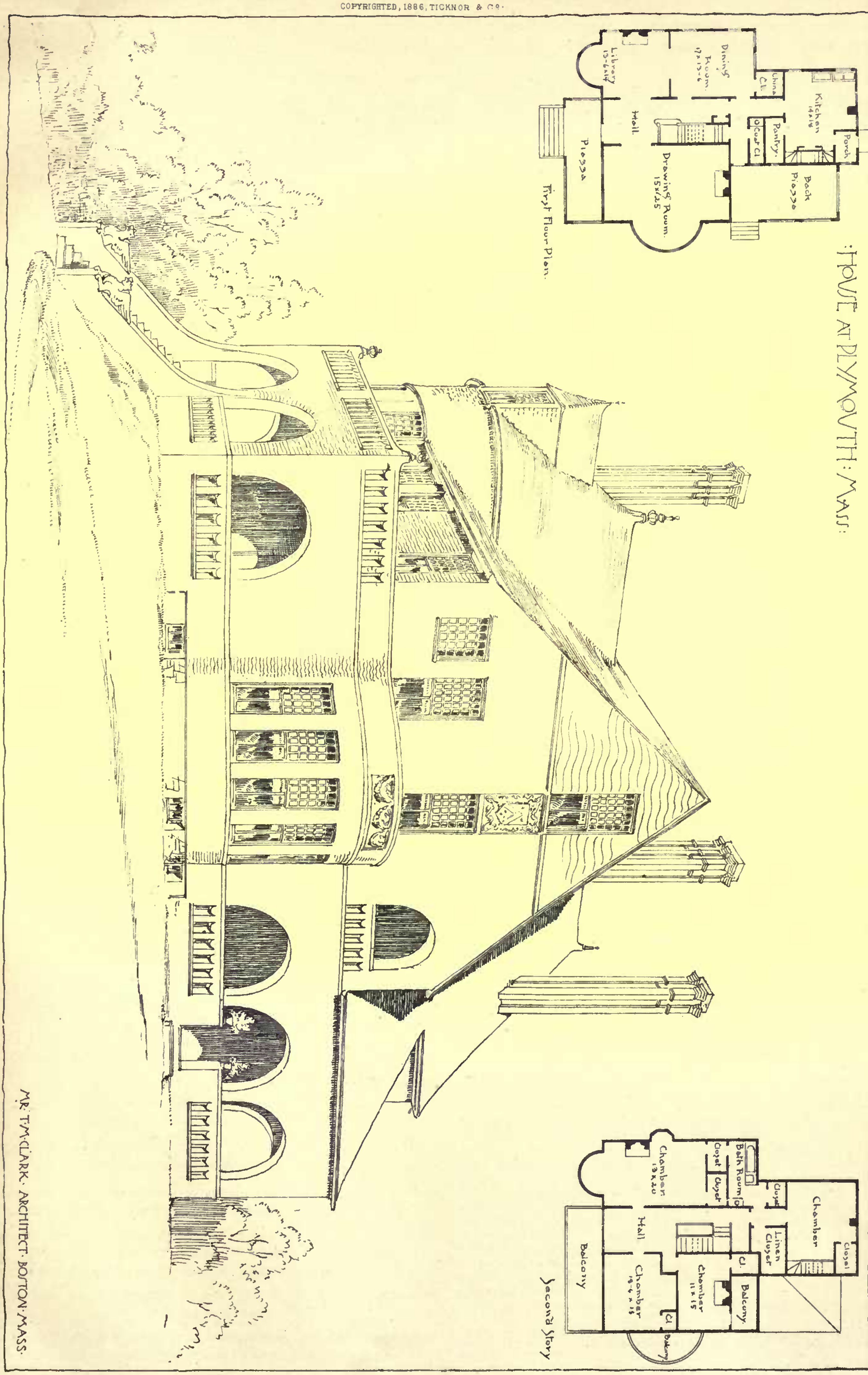
FRONT HALL IN HOUSE ON COMMONWEALTH AVE. BOSTON, MASS.



MESSRS. ROTCH & TILDEN, ARCHITECTS, BOSTON. MASS.

HELIOTYPE PRINTING CO. BOSTON

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Where $\Sigma\, w$ the sum of all loads between the *free* end and said point.

To find the strength of beam at said point necessary to resist the shearing, insert x for w in Formula (7).

In transverse strains there is also a *horizontal* shearing along the entire neutral axis of the piece. This stands to reason, as the fibres above the neutral axis are in compression, while those below are in tension, and, of course, the result along the neutral line is a tendency of the fibres just above and just below it, to slide past each other or to *shear* off along the grain.

We can calculate the *intensity* (not amount) of this horizontal shearing at any point of the piece under transverse strain.

If x represents the amount of vertical shearing at the point, then the intensity of horizontal shearing at the point is $= \frac{3}{2} \frac{x}{a}$.

If this intensity of shearing does not exceed the safe-constant $\left(\frac{g_1}{f}\right)$ for shearing along the fibres, the piece is safe, or : —

$$\frac{3}{2} \cdot \frac{x}{a} = \left(\frac{g_1}{f}\right) \qquad (13)$$

Where x is found by formulæ (11) or (12) for any point of beam, or,

Where $x = \left\{\begin{matrix} p \\ \text{or} \\ q \end{matrix}\right\} =$ the amount of supporting force, in pounds, for either point of support.

Where $a =$ the area of cross-section in square inches.

Where $\left(\frac{g_1}{f}\right) =$ the amount of safe resistance, per square inch, to shearing along fibres.

Example.

Take the same beam as before. The amount of vertical shearing 5′ *from support we found to be five hundred pounds, or :* —

$$x = 500.$$

The area was 8″ multiplied by thickness of beam, or : —

$$a = 8\,b.$$

The ultimate shearing along the fibres of spruce is about four hundred pounds per square inch, and with a factor-of-safety of ten, we should have : —

$$\left(\frac{g_1}{f}\right) = \frac{400}{10} = 40.$$

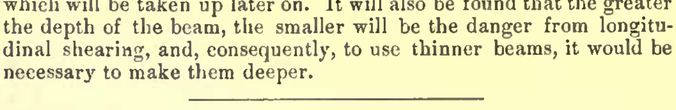
Inserting this in Formula (13) $\frac{3}{2} \cdot \frac{500}{8b} = 40$

or $b = \frac{1500}{16.40} = 2,''34.$

The beam should, therefore, be at least $2\frac{1}{2}''$ thick, to avoid danger of longitudinal shearing at this point. At either point of support the vertical shearing will be equal to the amount supported there; that is, one-half the load, or one thousand pounds. Substituting this for x in Formula (13), we have: —

$$\frac{3}{2} \cdot \frac{1000}{8b} = 40, \text{ or } b = \frac{3000}{16.40} = 4,''68.$$

The beam would, therefore, have to be $4\frac{3}{4}''$ thick at the points of support, to avoid danger of longitudinal shearing. The beam, as it is, is much too shallow for one of such span, a fact we would soon discover, if calculating the transverse strength or deflection of beam, which will be taken up later on. It will also be found that the greater the depth of the beam, the smaller will be the danger from longitudinal shearing, and, consequently, to use thinner beams, it would be necessary to make them deeper.



[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF W. K. VANDERBILT, ESQ., NEW YORK, N. Y. MR. R. M. HUNT, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

INTERMEDIATE PENITENTIARY, MANSFIELD, OHIO. MR. LEVI T. SCOFIELD, ARCHITECT, CLEVELAND, OHIO.

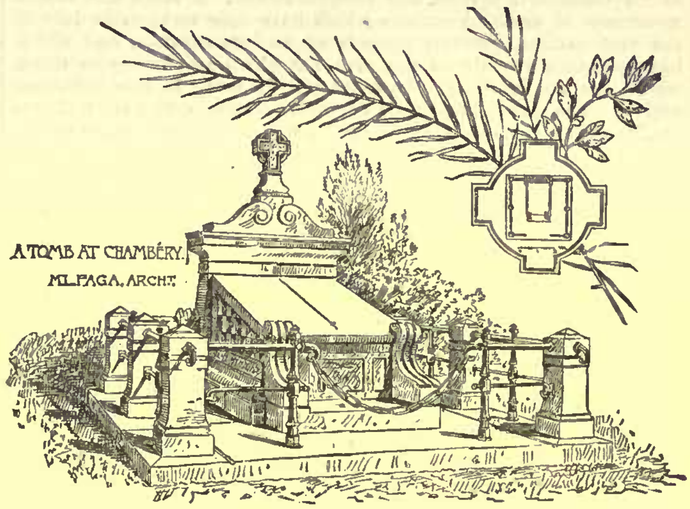
FRONT HALL IN HOUSE ON COMMONWEALTH AVENUE, BOSTON, MASS. MESSRS. ROTCH & TILDEN, ARCHITECTS, BOSTON, MASS.

OLD COLONIAL WORK, NO. VIII. — MANTEL IN PARLOR "WORKING WOMAN'S BUREAU," SALEM, MASS. MEASURED AND DRAWN BY FRANK E. WALLIS, BOSTON, MASS.

HOUSE AT PLYMOUTH, MASS. MR. T. M. CLARK, ARCHITECT, BOSTON, MASS.

HOUSE OF WM. T. WILSON, ESQ., NEAR CATONSVILLE, MD. MESSRS. J. A. & W. T. WILSON, ARCHITECTS, BALTIMORE, MD.

THE BOSTON PARK COMMISSIONERS' REPORT.[1]



THE eleventh annual report of the Park Commissioners is a comparatively brief document and presents little to arrest the attention or to call for extended remark. The work on all the parks has been carried on in a languid fashion, owing to the small appropriation made for the purpose by a city government ambitious of a reputation for economy. Progress is, however, visible, and on the ground which is perhaps of the greatest immediate interest to the citizens, namely, that of the Back Bay, it is now possible to form some tolerably clear notion of what is reasonably to be expected in return for the outlay of fifteen hundred thousand dollars. This, we are sorrowfully compelled to say, is not much. Indeed, it is quite plain that neither the commissioners nor their landscape architect himself, expect much from it. Mr. Olmsted now speaks of his scheme as a "design for managing the fluctuating waters of the Back Bay, . . . and for avoiding unseemliness of aspect." Surely modesty cannot go farther than this, and criticism is disarmed.

But, whatever of interest Mr. Olmsted may have lost in the improvement of the Back Bay (he deprecates, and not without reason, the application of the word "park" to this region), he has transferred, it would appear, to the five hundred acres at Roxbury now formally christened the *Franklin Park*. In regard to this territory he has sent forth with the report of the commissioners, a considerable pamphlet, prepared with much care, and setting forth the principles which have governed him in laying out this park — the advantages which may be expected from it, the danger of extravagance on the one hand, and of a foolish economy on the other, the difficulty thrown about the accomplishment of a scheme like this by the impatience and unreasonable criticism of the public, with various discussion of topics more or less closely connected with the main subject. The design, as finally adopted by the commissioners, is described with much particularity and is illustrated by a large map, which has been distributed by itself, Mr. Olmsted says, for the benefit of those who may find the essay too much for their time or inclination. Certainly the public has no cause to complain of not having been sufficiently taken into the counsels of the commissioners.

A plan like this for the laying out of a square mile of rural territory is not to be intelligently criticised without more familiarity with the ground, and the conditions which determine its treatment than can be got by cursory examination. We had occasion a year or more ago to speak with some severity of the sweeping destruction of fruit trees with which Mr. Olmsted entered upon his work. Our opinion of that remarkable performance has not changed, and we are convinced that it will be long before Mr. Olmsted's plantations will present to the tired eye of the hard-worked citizen such a refreshment as he has at one stroke forever deprived them of. But we are none the less disposed to look with keen interest on the plan through which he now proposes to develop the capabilities of this "stony upland pasture," while preserving, to a certain extent, such native features as it has been endowed withal. To a certain extent, we say. The park is an irregular, squarish rectangle, as nearly as possible a square mile in extent. Mr. Olmsted has divided this territory into two portions, of which the westerly portion, occupying about two-thirds of the whole, he calls the Country Park, while the remaining, or easterly third he calls the Ante-Park. The larger portion he has indeed proposed in great measure to let alone — "nothing is to be built, nothing set up, nothing planted, as a decorative feature; nothing for the gratification of curiosity, nothing for the advancement or popularization of science." There is to be no ambitious gardening, no planting of rare and costly exotics, humble field flowers are to be preferred to "high-bred marvels," and in short the country park is to be, as far as possible, a piece of nature's handwork, "improved" as little as possible by the hand of the professional landscapist. "For this relief, all thanks."

But as if to comfort himself for so much self-denial, Mr. Olmsted

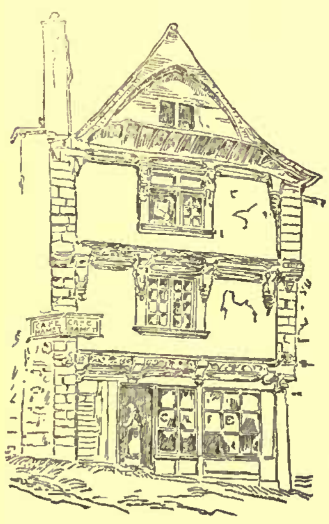
[1] Eleventh Annual Report of the Commissioners for the Department of Parks for the City of Boston for the year 1885. Notes on the plan of Franklin Park and related matters.

has accumulated in the Ante-Park, which is to the country park as "a fore-court, portico, and reception-room," a large and varied assortment of artificial features which have done serviceable duty in the metropolitan pleasure-grounds of various capitals, and which have an attractive air on the plan, but which we venture to think would, for the most part, be quite thrown away in this suburban region. The most conspicuous of these features, called the "Greeting," is thus described in the "notes": "This division is to be wholly occupied by a series of parallel and contiguous drives, rides and walks, a double length of each, under rows of trees forming a promenade or meeting ground of the Alameda type, half a mile in length. Monumental, architectural, and various decorative adjuncts, are here admissible, but not essential. There are suitable positions for statues, water-jets, baskets of flowers, bird-cages, etc." Now, the place which recurs to our memory as we read this description is the Pincian Hill, an enchanting spot where nature, art, and historic association combine to minister to the elegant leisure of a population of pleasure-seekers. Or it is Rotton Row in the centre of the greatest capital of Europe, where the wealth, fashion, ambition and ennui of all England meet to see and be seen. But there is nothing in the life of this little New England capital to create a demand for such a "Greeting" three miles out of the town. It is much the same with the Music Court, a sylvan amphitheatre, adapted to concerts."

In the Volksgarten, in the heart of Vienna, we have seen the admirable band of Strauss discoursing most eloquent music, night after night, to a gay and constantly changing company of Germans sitting at little tables with ices and beer, or promenading in the brilliantly lighted alleys of the place. But we cannot believe that Herr Gericke himself with his splendid band could invoke such a scene in any "sylvan amphitheatre" three miles out of town.

We need not pursue the subject. Other features are proposed with high-flown appellations — as the "Little Folks' Fair," "The Playstead," with its "Overlook," "Long Crouch Woods," reserved as a location for a zoölogical garden, the "Deer Park," etc., etc.— features which may in time be useful additions to the natural attractions of a suburban park but which involve a large annual expense for maintenance, and should be allowed to wait until a need for them has been shown. C.

EXPERIMENTS WITH LONDON SEWAGE.



House in St. Brieux, Brittany. After sketch by R. Phené Spiers.

THE Metropolitan Board of Works have just now under their consideration twenty-three tenders for the building of a vessel for carrying out "sludge" to sea. It is to be a steamship capable of running ten knots an hour with 1,000 tons on board, and must, of course, have special arrangements for discharging its malodorous burden out into the deep. This step is to be regarded as an experiment, and is supplementary to other experiments that have for some time past been going on at Crossness, and the further extension of which renders the establishment down there just now exceptionally interesting.

Every middle-aged person remembers the time when all the drains of London, or thereabouts, ran pretty directly down into the Thames on both sides. This abuse of the river at London was brought to an end by the "main drainage system," which came along with three large culverts on the north side and three on the south. These huge channels cut off the connection of the drains from the Thames, and received their contents. The three on the north side of the river meet at Abbey Mills, and from thence pour their contents through three connected sewers down to Barking Creek, where the whole volume of sewage is discharged into the river on the ebb tide. That is the arrangement existing at the present moment on the north of the Thames, and the population served by this northern system comprises about two-thirds of that of the whole metropolitan district. On the south side of the river, as we have said, there are also three main sewers running parallel with the river, and cutting off from it all the minor drains. Of these three, two meet at Deptford, and the third — the high-level sewer from the neighborhood of Sydenham — joins the other two just below Deptford, and from thence there is a common sewer running down to the river at Crossness. The area served by this system is greater by half than that drained by the northern sewers, but the population within it is only about half that of the other. On the north side, therefore, they get a larger normal outpour of sewage because they have the larger population. They discharge from eighty million gallons a day — about 350,000 tons — up to one hundred and fifty million gallons. But in time of rain and storm the south side, having the greater area, gets the most flood water, and the quantity they have to deal with at Crossness ranges from sixty millions to one hundred and seventy millions gallons. They do not get all the storm-water here. There is an overflow for it at Clapham, and there is another at Lewisham. But half an inch of rain in the course of a day will make a difference to them here of 150,000 gallons.

At Crossness, then, they have to deal with sewage to the amount of from 60,000,000 to 170,000,000 gallons a day, and till recently they did here just as they are still doing at Barking Creek — that is to say, they pumped it up into a huge reservoir, and on the top of the ebb tide they opened their sluices and poured it out. Indeed, the great bulk of their sewage they are still pouring out here. They have a huge receptacle, in the shape of a brick reservoir, over six acres in extent, into which they pump up the filthy stream coming down to Deptford. It need hardly be said that this reservoir is not uncovered. Its floor consists of a series of brick "inverts," and it is roofed over with a corresponding series of arches, and the whole structure is heaped over with earth. The top of it is a field around which are trees and shrubs and flower-beds, and on the skirts of which are handsome blocks of offices, the superintendent's house, cottages for employés, etc. The six and a quarter acres of the reservoir down below this pleasant and breezy elevation are divided into four compartments. From three of the four the sewage is discharged into the river just as it is received, or at least merely deodorized. The fourth compartment has been subdivided, and the contents of these subdivisions are the subject of the interesting experiments already alluded to.

About the beginning of last year the Metropolitan Board of Works determined to see what could be done in the way of the separation of the solid portion of the sewage from the fluid. They decided to begin with about 1,000,000 gallons a day — the sewage of a population of about 36,000. Of course, if a quantity of sewage be merely allowed to remain in a tank for a time, the solid part of it, or much of it at any rate, will settle at the bottom. But experience seems to show that if certain additions be made to the sewage this process of settlement, or "precipitation," will be very much more rapid and more complete. As the result of a long series of experiments carried on with the view of determining what process would give the best results at the lowest cost, it was found best first of all to well mix up the sewage with a certain proportion of lime, and then to add to it a solution of proto-sulphate of iron. The whole compound was then run off into subsiding reservoirs, in which it was allowed to remain for not less than two hours. Of course, at this time of year the sewage is not at its worst. Decomposition is slower than in hot weather, and usually we have a good deal of rain; but a large reservoir full of sewage treated with lime and iron, inspected a day or two ago at Crossness after remaining undisturbed for a couple of hours, presented so close a resemblance to pure water that any one who did not know what it really was would have had no hesitation at all in taking a bath in it. At the end of two hours the water is drawn off. Practically, the whole of the suspended solid matter has been precipitated, but the water may, nevertheless, be full of chemical impurity, and it is, therefore, treated with permanganate of soda and discharged into the Thames. The sediment remaining at the bottom of the reservoir is swept up and plunged into "sludge settling tanks," where it is allowed to remain for twelve hours, when there will be found to be a further accumulation of water on the surface. This is drawn off, and the residuum has now to be dealt with. It throws, by the way, rather a striking light on the problem presented by London sewage to find that, after about eight feet of tolerably clear water has been drawn off from it, only about half an inch of solid sewage remains. This is not absolutely all the solid matter that was in the original sewage, but it is so nearly all that if they were to double their outlay in the perfecting of their system they could only get about another fiftieth part of solid suspended matter. This shows very strikingly the truth of what has often been said, that it is not the sewage of London, but the water added to it that constitutes the great difficulty.

The "sludge" having been eliminated from the whole volume of the sewage, there remains the question, what is to be done with it? Upon this branch of the subject experiments have also been in progress of late, and, as we have intimated, are just about to commence on a larger scale. When the Board determined last year to deal with a million gallons of sewage a day, they resolved to test the practicability of compressing this sludge by machinery, so as still further to eliminate the water from it, and reduce its bulk. They set up the necessary plant, therefore, and have been turning out about five tons a day of this solid sludge. The practicability of this process has been demonstrated, but what as yet remains to be shown is the possibility of disposing of the solidified sewage in large quantities. It is considered that the small quantity they have hitherto turned out hardly affords a criterion on this point. It may be easy enough to get rid of five tons a day; but it may be a very different matter when they come to treat the whole of the London sewage in this manner, and have some nine hundred tons a day to dispose of. Instead of one million gallons hitherto dealt with, they have determined to experiment with nine million gallons, and a press weighing forty-five tons has just been completed. In connection with this press, there are three "receivers" — strong iron receptacles, six feet by twelve feet — sunk in the ground. One of these receivers is charged with air under a pressure of one hundred pounds to the square inch. Into another is poured a certain quantity of lime, dissolved in water, and then the liquid sludge is also injected with sufficient force thoroughly to mix it well with the lime-water. The third receiver is put

under water pressure, by which the condensed air in the intermediate receiver is driven into that containing the diluted sludge, which in its turn is expelled from the receiver and forced up into the press. It will thus be seen that the actual force is hydraulic, the air-chamber being merely a buffer interposed between the water and the sewage to prevent their mixing. The pressure in the chamber — one hundred pounds to the square inch — is, of course, that under which the sewage is held in the press, which is an arrangement of iron plates and jute cloths acting as strainers, through which practically the whole of the moisture is forced, leaving a solid cake of about a third of the bulk of the liquid sludge, and having the appearance when thrown out in a heap of a lightish brown clay.

The manurial value of this compressed matter seems to be as yet a moot point. Whether its fertilizing capabilities have been washed out of it, or whether it is a valuable manure; or, again, whether, supposing its intrinsic value being assumed, farmers and market-gardeners can be convinced of its worth, are the points which, as yet, have to be conclusively settled. It may be that the value of this compressed sewage may make it an advantageous mode of dealing with the outpouring of the main sewers. On the other hand, it may prove on the whole cheaper to take three times the quantity of uncompressed sludge to the sea and throw it overboard. These are, in brief, the points which the Metropolitan Board of Works have determined to put to practical test, and, in order that the test shall be a practical one, they have, as we have said, just set up new appliances for compressing on a much larger scale than heretofore, and they are going to buy a vessel for the purpose of carrying out the sludge in its uncondensed form. Which of the two systems will be eventually adopted will depend upon the comparative results obtained.

It may be worth while to add that one interesting feature of these Crossness works is about to disappear. During the cholera scare the summer before last the Board found that all the manufacturers engaged in producing permanganate of soda could not supply anything like the quantity they required. This disinfectant ran up enormously in price, and at one time was fetching £40 a ton in the market. A factory was set up here, and the necessary plant obtained, and a large quantity was turned out at a cost of about £20 a ton, twenty tons a day being at that time required for the outfalls on both sides of the river. Further machinery was added, and eventually permanganate of soda was turned out at £12 pounds a ton. The great demand of that time, however, so developed the means of supply, that manufacturers are now tendering the disinfectant at £11 a ton, and the Board have determined to discontinue making the thing on their own account.— *The London Daily News.*

PROFESSOR RUSKIN'S GUILD OF ST. GEORGE.



From Sketch by Thos Garratt.

THE fascination exerted upon our imaginations by the romantic features of St. George's Guild, does not spring from the novelty of the idea of such an institution (there have been many other organizations for the testing of socialistic crochets and hobbies), but from the *bizarre* and poetical nature of the founder, the astonishingly visionary character of many of his schemes, and the large financial sacrifices he has made for their realization.

The prime object of the Guild is "the general medicining, enriching, and preserving in political strength the population of Great Britain." This is to be accomplished by purchasing some pieces of ground to cultivate, subjecting the cultivators to certain rules, and educating both them and their children. There is no colony, or community, localized in a central place; but the members still follow their own business wherever they are, merely subscribing to the rules of the Guild, and contributing a small fraction of their incomes for the expenses thereof. One of the chief objects of Mr. Ruskin was to show whether refined education was not possible to persons maintaining themselves by agriculture or other useful labor, and to convince some portion of the upper classes of society of the superiority of such occupations to their favorite profession of war.

It was Mr. Ruskin's (Biblical) idea at first that every member should pay to the Guild one-tenth of his or her income; but later this idea had to be abandoned. The central plan, always kept in view, has been the agricultural one, the intention being not merely to cultivate ordinary land, but to recover barren, rocky, or marshy districts, and bring them into good bearing condition. No matter on how small a scale the thing is begun, said the founder. Better try the experiment in two or three poor men's gardens than not at all. But supposing some pieces of land of respectable size were secured, then, said he, we will ascertain the absolutely best that can be made of every acre—flowers native to the soil shall be sown in the wild places, fruit-trees planted, cottages built, pasturage extended, and every foot of the land developed to its utmost.

We are prepared, of course, to hear that in these little paradises there are to be no steam-engines, no railroads, no idleness, no equality, and "no liberty," and that laborers shall be paid fixed wages; children to be educated compulsorily in agricultural and naval schools — the boys to learn swimming or sailing; the girls, spinning, weaving, sewing, and cooking; both sexes to be taught botany, dancing, music and art, also instructed in gentleness, finished courtesy, truth-speaking, obedience. As they grow older, they are to learn the natural history of the place they live in, to know Latin, and the history of Athens, Rome, Venice, Florence, and London. Young men who deserve higher education are to receive that of a Greek gentleman of the Periclean age, plus Christianity. Boys are to be taught "thoroughly, and with awe," the physical laws relating to their bodies.

The Guild was founded in 1871, and duly registered as a limited liability company, Ruskin as first Master, making over to it a tenth of his income. He was worth at that time about $550,000. Up to July, 1876, after five years of existence, the membership of St. George's Guild numbered only thirty persons, some of them young ladies. It curiously marks the unpopular nature of the enterprise that the Master, in making his list of names, dared to give at first only the initials, and afterwards, the first and last names of such Guildsmen and Guildswomen as he thought would not blame him for so doing.

Up to July, 1877, the Guild had available cash to the amount of £3,487 12*s*. The title was changed from "Company" to "Guild" in 1877, owing to the ideas of fraudulency connected with so many companies of England (curious reason for changing). About the same time, also, the requirement of a tithe was dropped, as it had proved a grievous stumbling-block to the rich. It was now announced that anybody would be received as a Companion who, complying with the principles and methods of the association, would contribute one per cent of his or her income, up to £10 on incomes reaching a thousand a year, the understanding being that, above that amount, nothing would be asked. At the same time, the word "Companion" was reserved as the appellation of a superior order of the association, the members of which would be willing to give one-tenth of their income, while ordinary Guildsmen gave only one per cent thereof. Yet in spite of small membership and languid progress of work, it cannot be said that the Master's reform movement has borne no fruit. If proof were needed, it is afforded, for one thing, by the establishment, in 1879, of the "Ruskin Society of Great Britain," with headquarters at Manchester, and branch societies at Aberdeen and Glasgow, the chief aims being to promote the study and circulation of Mr. Ruskin's writings, to exemplify his teachings, and to aid his practical efforts for social improvement.

The work done for St. George has been not only of an interesting nature, but of considerable extent. The first piece of actual work performed seems to have been a bit of road-making at Oxford by the students. The first interest from St. George's fund Mr. Ruskin spent in the vain attempt to keep perfectly clean a bit of London street; a cloth mill has been erected in the Isle of Man, for weaving the wool of the Manx sheep; various plots of ground have been purchased, and at least one of them has been put under cultivation; Mr. Ruskin restored, at a cost of $2,500, a beautiful pool[1] at Carshalton, near the home of his boyhood (Herne Hill, by London); he has done a good deal of expensive terracing at his own residence — Brantwood, in the Lake District — where, however, the wood hyacinths and heather seem to outweigh in value the hay and strawberries. One of the most amusing projects of the Master was the establishment of a tea shop at 29 Paddington Street, London. Here the patient idealist installed two of his mother's aged servants as clerks. The idea was to sell good tea in as small packets as people chose to buy, without charging a profit on the subdivision. But the absence of illumination by gas, and the eschewing of the rhetoric of advertisements, as well as the increase in the consumption of spirits throughout the neighborhood, made sales slow. The chief check, however, on the trade of "Mr. Ruskin's Tea-shop," he thinks, was his delay in painting his sign. He could not for months determine whether the said sign should be of a Chinese character — black upon gold; or of a Japanese — blue upon white; or of pleasant English — rose color on green; and still less how far legible scale of letters could be compatible, on a board only a foot broad, with lengthy enough elucidation of the peculiar offices of the establishment. Meanwhile, rent and taxes ate up the profits, and something in addition.

But all these experiments have been only subsidiary to the main enterprise of founding a great educational museum at Sheffield. The Master intends to make his Museum of St. George the practical embodiment of all that he has taught in his writings on art and natural history. A beginning has been made; and such collections as have been got together are exhibited in a temporary museum in Upper Walkley, a hill suburb of Sheffield, inhabited chiefly by poor artisans.

The constitution of St. George's Guild has been described as that of an aristocracy, which elects an absolute chief, or doge. The members, in the order of their rank, consist of (1) the master, (2) the marshals, (3) landlords, (4) tenantry, craftsmen, and hired laborers. Without going into details as to the respective functions of these ranks, let it be said that labor and the laborer hold the place

[1] The following piece of superb English, and of exquisite sentiment, Mr. Ruskin had carved on the fountain: —

"IN OBEDIENCE TO THE GIVER OF LIFE, OF THE BROOKS AND FRUITS THAT FEED IT, OF THE PEACE THAT ENDS IT, MAY THIS WELL BE KEPT SACRED FOR THE SERVICE OF MEN, FLOCKS, AND FLOWERS, AND BE BY KINDNESS CALLED MARGARET'S WELL."

of chief honor. All measures have reference to the laborers' well-being, and the authority of the Master and the superior officers is derived from him.

The first maxim of the Guildsmen is "to do good work, whether they live or die." Marriages are to be regulated by the Guild. As to courtship, the sum and substance of Mr. Ruskin's ideas is this: No girl should reject a lover at once nor accept him at once. A girl worth anything ought to have half a dozen suitors; and she is to put them all on probation, requiring of them as many lions' skins and giants' heads as she thinks she is worth. If a lover is absolutely disliked by her, "she may send him away for seven years or so, he vowing to live on cresses and wear sackcloth meanwhile," or do something of the kind to show his worthiness. When we read such funny things as this in Mr. Ruskin's books, we begin to understand the meaning of that quizzing, mischievous look in the eyes which he is reported occasionally to show.

The members are to use no machines, except for very heavy work, and no railroads, except for speed of travel on main lines of communication.

The rents levied by St. George will differ from common rents in respect of being lowered instead of raised in proportion to every improvement made by the tenant. Furthermore, the rents will be employed in making improvements on the estates of the tenants, landlords not being allowed to take any money except what they earn by their personal labor. (This is surely a socialistic measure which would go far toward establishing the equality which Ruskin says he detests.)

There is to be a national store of wealth (idea seems to have been taken from Proudhon) instead of a national debt — the store, or reserve fund, to consist of food, clothes, books, and works of art. The government will always have enough of these in its possession to meet the entire demand of its currency in circulation. "Government!" "Currency!" thinks the reader. "Why, we shall then have a government within a government." Even so. But the creed, or constitution, of St. George demands, in its seventh article, entire loyalty to the existing administration, unless it be proved to be contrary to the laws of God. In this respect (loyalty), it exactly resembles the constitution drawn up by John Brown for his anticipated republic of blacks. John Brown suffered martyrdom. But I suppose no better proof could be asked of the visionary nature of the English John's similar movement for the liberation of the white slaves of labor than the complete indifference of the existing government to this bold little rebel flag of St. George, run up by a sick and despairing prophet in the very heart of the vast empire of Great Britain.

The only use to which the Guild will put its precious metals will be to employ them for currency and in the arts. The Guildsmen are to eat out of delft and drink out of pewter (idea taken from More's "*Utopia*." Ruskin has clearly studied all the Utopias, from Plato down to Brook Farm). There will also be paper money; but it will be a matter of financial indifference what part of the circulating medium is in coin and what in paper, since the power of each is but that of a government receipt for goods delivered into the general store.

In dress, everybody will have to look to it that he be clean as wax, and no ragged garments allowed. The dress of the superior orders and officers always to be plainer than that of the "peasants," as Ruskin calls them (this idea about dress also taken from Sir Thomas More). Hereditary nobles entering the Guild are kindly permitted to retain the insignia of their rank; but they must all promise to wear uncut jewels, if they wear any at all.

Professor Ruskin's cardinal idea of obedience is to be practically enforced with a vengeance in the government of which he is *τύραννος* He, at one time, actually entertained the idea of ruling his peasant-slaves (I will justify the phrase immediately) by the iron rod of the military order! He states that in early life he had known so many good and wise soldiers, and had observed so constantly in his historical reading (notice how always and always he falls back for justification upon precedent, upon the past) the beneficence of military rule in time of peace, that he had seriously thought of choosing the commandants of the Guild from veteran soldiers. It was also his intention to select the laborers from such domestics and retainers of old families as had been thrown out of employment by modern social changes (these persons attractive to him because of their habits of unquestioning obedience). Well, when he had thus provided for discipline, let us see how he would crack his whip over his coffles of peasant slaves (*Fors*, I., Letter 37). The laboring Guildsmen are *compelled*: —

(1) To rent their land temporarily of the Master; and they can be ejected, if they prove intractable.[1]

(2) To pay over one per cent of their incomes for St. George's Benevolent Fund.

(3) To cultivate their land as the overseer may direct.

(4) To build their houses with prescribed materials, and to a fixed degree of strength.

(5) To send their children to the schools where Mr. Ruskin's ideas on education will be carried out.

(6) To take no newspaper except the one to be published by the Master, and to read no books but those published, edited, or selected for the Guild's library by him.

(7) Each and all to render "unreasoning obedience," solemn and constant, to the officers set over them.

[1] All of these conditions may be found in various parts of *Fors Clavigera* and *Time and Tide*, whence I have culled them forth.

(8) To use only such machinery as the Master may direct.

(9) To obey, in general, the laws of Plato, Christ, Lord Bacon, Sir Thomas More, and the Florentines of Dante's time.

(10) Every tradesman's books must be open to inspection on the Master's order, and his entire business affairs, including the percentages paid to clerks and producers, known to everybody.

(11) "And finally," says Ruskin, "people whom I catch doing as they like will generally have to leave the estate!"[2]

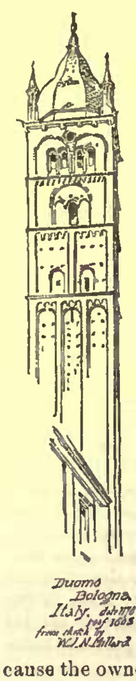
At this point, I make no doubt my readers are rubbing their eyes and asking themselves just where about in time they really are, and if they are in possession of their senses. Don't tremble or get alarmed, dear friends. Our liberties are still safe: there is no danger of Professor Ruskin being intrusted with autocratic power. He is only dreaming, after all. Will you examine a specimen law of our ideal government? It is only six hundred years old, and comes from Florence. The law away back there was that no citizen should buy fish to sell again to middlemen. In this way, you get fresh fish, do you see? Now, we must have this law in St. George's Guild. But how to get our fish to their proper market and sold? Why, what else have the sons of the fishermen to do, and what else have idle clergymen to do, better than to peddle good fish? The day must come (says Ruskin, in all seriousness) when gentlemen will turn fish-mongers, and, hiring themselves out to the fishermen, take dripping basket on back, and cry their finny wares through the cities!

"They may stagger on, perhaps, a year or two more in their vain ways; but the day *must* come when your poor, little, honest puppy, whom his people have been wanting to dress up in a surplice and call 'The to be Feared,' that he might have pay enough, by tithe or tax, to marry a pretty girl, and live in a parsonage, — some poor, little, honest wretch of a puppy, I say, will eventually get it into his glossy head that he would be incomparatively more reverend to mortals, and acceptable to St. Peter and all the saints, as a true monger of sweet fish than a false fisher for rotten souls; and that his wife would be incomparably more 'ladylike,' not to say madonna-like, marching beside him in purple stockings and sabots, or even frankly barefoot, with her creel full of caller herring on her back, than in administering any quantity of ecclesiastical scholarship to her Sunday schools.

"'How dreadful, how atrocious!' thinks the tender clerical lover. '*My* wife walk with a fish-basket on her back!'

"'Yes, you young scamp, you. You were going to lie to the Holy Ghost, then, were you, only that she might wear satin slippers and be called a lady!'"—*William Sloane Kennedy's letter to the Index.*

THE BUILDING OF STABLES.



Duomo Bologna Italy. date 1170 roof 1603 from sketch by W.J.N. Millard

IT may be well to preface this article by saying that the following remarks are a brief summary of the *desiderata* in stable-building, as regarded from the point of view of the owner of the horses to be provided for. The subject is sufficiently important to make a non-professional opinion of some value.

It is surprising to observe how careful many persons are as to the construction and fitting-up of their houses — how careless they are in regard to their stables. It is true that more intelligence is now shown in the management of horses than was visible even a few years ago, but that progress is still of a comparative character; so that the carelessness about the stables arises from a kind of popular ignorance in regard to the management of horses. Continually those who take a personal interest in everything which concerns their houses will be found to leave the stable management entirely to itself. Hence, the construction and fitting of stables are often left altogether to the architect and builder. The former has quite enough to do with looking after the house without troubling much about stables, and in all probability he has seldom studied this question from a practical point of view. He will plan a picturesque and pleasing exterior, and then his task is over. But too often the owner of the premises does not give him free scope, even in regard to this. If he interferes, it is on the stables where the money is to be saved, and over and over again stables may be seen wholly inferior in architectural character to the house, simply because the owner, while feeling it necessary to erect stables, has thought it advisable to spend as little money upon them as possible. Badly-constructed stables are never economical, and in many cases a little extra money spent on them will repay itself in the better condition of the horses which will have to inhabit them.

A cardinal principle in the erection of stables is the selection of a site. Stables are too often put up in any back region, but they should always be built in the warmest and sunniest aspect which is obtainable. Not warmed, as are houses, artificially: the warmth of the sun

[2] So Carlyle, in "*Shooting Niagara*," suggests that the English lords might form their estates into miniature and model communities, drilling and disciplining their tenants, and *banishing the refractory*. How all this arrogance of Ruskin and Carlyle contrasts with the spirit of gentle Walter Scott, who, though ostensibly as conservative as his two countrymen, yet, when he was settling a few families at Abbotsford, made only two conditions: first, that they should keep their cottages and doorways and little gardens tolerably neat; and second, that the men should keep their guns from the game, and the boys their hands from the birds' nests and newly-planted woods! (Lockhart's *Life*, vol. v., p. 289, original edition).

is most necessary to keep them as dry and warm as possible. Dryness is very essential for good stables, and, therefore, a site where drainage is easy and good should be selected. Damp stables will cause disease not only in the lungs and bronchial tubes of a horse, but also in his feet, and may cost the owner not only anxiety, but money. It has to be borne in mind, also, that both sunny and dry stables are requisite for keeping carriages in proper condition. Hence, no one should build a stable or coach-house except on a dry site and with a warm aspect.

Another element in regard to the construction of stables of the highest importance is that they should be built as substantially as possible. Warm stables in winter are absolutely necessary for horses, if they are to look well and do their work well, and equally in summer they should be cool.

The aim of the builder of stables should, in fact, be to erect them so that they may be kept internally at a moderate and equal temperature throughout the year, so far as that is possible. Horses come warm into a stable, and they cannot, as we can, stand with their backs to the fire. Hence, it is most necessary that in winter-time they should not be received into stables which will chill them. On the other hand, too much care cannot be taken in regard to ventilation.

Many horses are lost every year owing to insufficient ventilation. The stables get hot and close, and a horse is stripped of his clothing and brought into the cold air. The human being, with much the same constitution, puts on an overcoat when he turns out. It is not surprising, therefore, that horses get colds, coughs, and sometimes die, sometimes become permanently injured in their wind. While, therefore, a stable should be temperate, it should not be hot, and accordingly the ventilating apparatus should be as effectual and as easily worked as possible. Barely one stable in ten is properly ventilated, and artificial warmth is never supplied, though most stables might obtain it from the harness-room fires by means of hot flues or hot-water pipes connected with the boiler, to be used according to the external atmosphere.

The fitting-up of the stable will hardly, perhaps, be considered as within the province of an architect, but it is a matter with which every architect should be acquainted. The great point to bear in mind is that loose-boxes should be put up, and not stalls. The common practice is to have about three stalls to one loose-box, whereas the proportion should be reversed. The freedom which a horse has in a loose-box is of vital importance. To point out the reasons for this would be to go into matters scarcely fitted for this journal, but, whether for actual general health, or for keeping a horse sound in his legs, a loose-box is very necessary. There is no need to have them large, but loose-boxes should be sufficiently roomy for a horse to turn in with comfort. There are many stalls which, with an extra foot of breadth, would make reasonably good loose-boxes.

We may shortly summarize a few more hints. The harness-room should never be a passage-room, though, on the other hand, it should be directly connected with the stables. Where the stables are large, it should be double, in the nature of a scullery and a kitchen, the outer harness-room for rough work, the inner for keeping saddles, etc., and for doing lighter and cleaner work. Large coach-houses are to be avoided; several smaller ones are better. To have several carriages packed in one coach-house causes them to be constantly knocked and bruised, whereas, when one, or at most two, carriages occupy one house, they are not so likely to receive damage. When stables are of any size there should always be one or more large, loose-boxes at a distance from the general range of stabling for the use of young horses, or mares with a foal, or for the purpose of summering hunters. If possible, the stable should be planned so as to be connected with a small grass paddock — a mere plot of grass is sufficient. This serves as a place for a horse to be turned into in spring or summer for an hour or two, occasionally, and as an exercising ground when a track is laid down with straw in hard winters. Again, every stable should be provided with one or two sleeping-rooms, which should be over the harness-room. As to the drainage, it goes without saying that it should be as perfect as possible. It may be said that the stables we have described are small, but the same principles are applicable to large ones, and, in all respects, the latter are but the small ones multiplied. Having regard to the great value of horses, to the carelessness, economical views, or ignorance of so many, if not most, horse-owners, architects should always do their best to insist on stables being erected on intelligent principles and in the best possible manner.— *Builder.*

SOCIETIES

AMERICAN INSTITUTE OF ARCHITECTS.

THE Board of Trustees of the American Institute of Architects, in recording the decease of a late Honorary Member of the Institute, James Fergusson, F. R. S., M. R. A. S., F. R. I. B. A., etc., etc., desire to express their high estimate of his eminently valuable and productive labors in the field of historical architectural criticism, and of his profound and extended researches into the origin and development of architectural styles. His grand work on East Indian Architecture stands unique, and will always be a mine of wealth for future investigators. His "*History of Architecture,*" developed from his previously-issued "*Handbook,*" forms the highest authority on the subject for English-speaking architectural students and connoisseurs; while these and his many other architectural writings, published during an active career of authorship of forty years, all attest the depth of his scholarship and his earnest devotion to the cause of good architecture—a devotion which those who were fortunately brought into contact with the man found to be as sincere as it was enthusiastic.

Much of the modern catholic and sympathetic appreciation of the beauties peculiar to each style is owing to his teachings, and the influence of his work is felt in all directions by the present generation of architects.

A most notable fact in connection with Mr. Fergusson's long and highly honorable career is that he was not educated to architecture, either as a practitioner or an amateur, but to mercantile pursuits, and that he voluntarily gave up fire prospects in this direction for the sake of devoting himself to the disinterested study of architecture and to the literary elaboration of the history of its forms. The profession, while deeply mourning his loss, should feel grateful that he was yet spared to an advanced age, while retaining in its behalf and in that of the cultured public, the full vigor and active use of his faculties to the end.

Adopted in Board of Trustees, A. I. A., May 21, 1886, and ordered to be forwarded to *American Architect* for publication.

GEO. C. MASON, JR.,
Secretary, A. I. A.,

Per A. J. BLOOR, *Secretary, pro tem.*

NEW YORK CHAPTER, A. I. A.

Whereas, the New York Chapter of the American Institute of Architects have heard, with deep regret, of the demise of Henry Hobson Richardson, a Fellow of the Institute, and, during his residence in New York, a member of this Chapter, therefore: —

Resolved, that in his death, after a long and courageous struggle with painful and incurable disease, the profession in which he so masterfully labored has lost an associate whose whole strength was in vital alliance with his art, and whose productions have not been surpassed by those of any of his compatriots, and have contributed, certainly not less than any, to give our new country a distinct claim, before the world, to a rank in the domain of Art, somewhat commensurate with that position in other fields of civilization which it already filled. At the same time they amply illustrate the value to every professional aspirant, no matter how well gifted by nature, of long and careful training in his proposed specialty; while the splendid results that may be attained by persistent application in one school of architectural expression is not less strongly marked in his career.

Resolved, that the above preamble and resolution, signed by the President and Secretary of the Chapter, be transmitted to Mr. Richardson's family, with an expression of condolence in their affliction.

ILLINOIS STATE ASSOCIATION OF ARCHITECTS.

THE committee of the Illinois State Association of Architects, appointed to frame a proposed State law to regulate the sanitary construction of buildings, held an important meeting yesterday at the rooms of Adler & Sullivan in the Borden Block. There were present, Frederick Baumann, Dankmar Adler and William Holabird, of the committee; and Dr. John H. Rauch, Secretary of the State Board of Health; Dr. Oscar C. DeWolf, Health Commissioner of Chicago, and W. H. Genung, of his department; S. G. Artingstall, City Engineer, and O. A. Cheney, Superintendent of the Sewerage Department.

The topic first taken up was the form which the proposed legislation should take. Mr. Baumann advocated a law which should appoint a commission and give it power to make regulations and enforce them. He advocated this because it would permit changes to be made in the regulations as experience or scientific inquiry would suggest. This form of law was opposed by Dr. DeWolf because the regulations could not be enforced by penalties, and he held that the Supreme Court of the State had decided that an appointed body could not exercise legislative functions. He claimed that to secure the most positive enforcement, the law must be as specific as possible.

A specific law being tacitly considered a necessity, the discussion took a wide range, involving many more points in sanitary construction. The use or disuse of catch-basins, the placing of plumbing pipes in sight, the connection of privy-vaults with the sewers, and the responsibility the architect bears in the sanitary construction of a building, and other questions were thoroughly discussed. While no provisions were actually agreed upon, it was considered that a great advance had been made in coming to a mutual understanding. The committee will select a lawyer and draft a bill which will be submitted at another conference.—*Sanitary News.*

TO SOFTEN HARD PUTTY.— To soften putty that has become hard by exposure, so as to remove it easily from a sash, take one pound of pearlash and three pounds of quick stone lime; slack the lime in water, then add the pearlash, and make the whole about the consistency of paint. Apply it to the putty on both sides of the glass, and let it remain for twelve hours, when the putty will be so softened that the glass may be taken out of the frame with the greatest facility.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

WINDMILLS FOR WATER-SUPPLY.

New York, May 28, 1886.

To the Editors of the American Architect:—

Dear Sirs,—I am informed that the last issue of your valued journal contains a reprint of my paper on "Windmills for Water Supply," published by me, over my signature, in *Engineering News*, December, 1885, but that you credit the paper to the *Hydraulic* or *Sanitary Plumber*, not mentioning my name or the *Engineering News*. Knowing the high sense of honor of your journal, I feel certain that your action in this matter is either an oversight or the result of misunderstanding of the facts. I know you will be pleased to make proper correction in your next issue.

Very respectfully, Alfred R. Wolff.

[The article referred to was, we believe, properly credited by us to the journal in which we found it printed, and, as we had no clue either to its original place of publication, or to its author's name, we were not conscious of doing injustice to any one.—Eds. American Architect.]

VERMIN IN SOUTHERN PINE.

New Orleans, La., May 22, 1886.

To the Editors of the American Architect:—

Dear Sirs,—Please allow me to make the following suggestions in reference to your explanation of "Vermin in Southern Pine," given in your No. 542:—

In thirty years' practice I have not only not seen, but never have heard of any one finding a *bed-bug* on new yellow-pine lumber.

There is a *flying bug*, called *wood chintz* (orthography uncertain), generally green, about the size of a finger-nail, emitting a smell similar to that of the bed-bug. But it is altogether a rustic animal, and if it be sometimes found in lumber, the isolated specimens so rapidly disappear as never to my knowledge to have attracted attention, any more than any other kind of insect accidentally caught in a hiding-place.

If real bed-bugs are found in lumber arriving in Boston, I suggest that they may be deadheads from *ship-board*, and that Southern pine reaching Detroit may be reasonably expected to be free from them. Respectfully, Jas. Freret, *Architect.*

MASTER-BUILDERS' ASSOCIATIONS.

Boston, Mass., May 18, 1886.

To the Editors of the American Architect:—

Dear Sirs, — Will it be possible for you to ask through your columns for information which will enable you to prepare a list of all master builders' associations throughout the country.

Yours truly, Wm. H. Sayward, *Secretary, M. B. A.*

NOTES AND CLIPPINGS

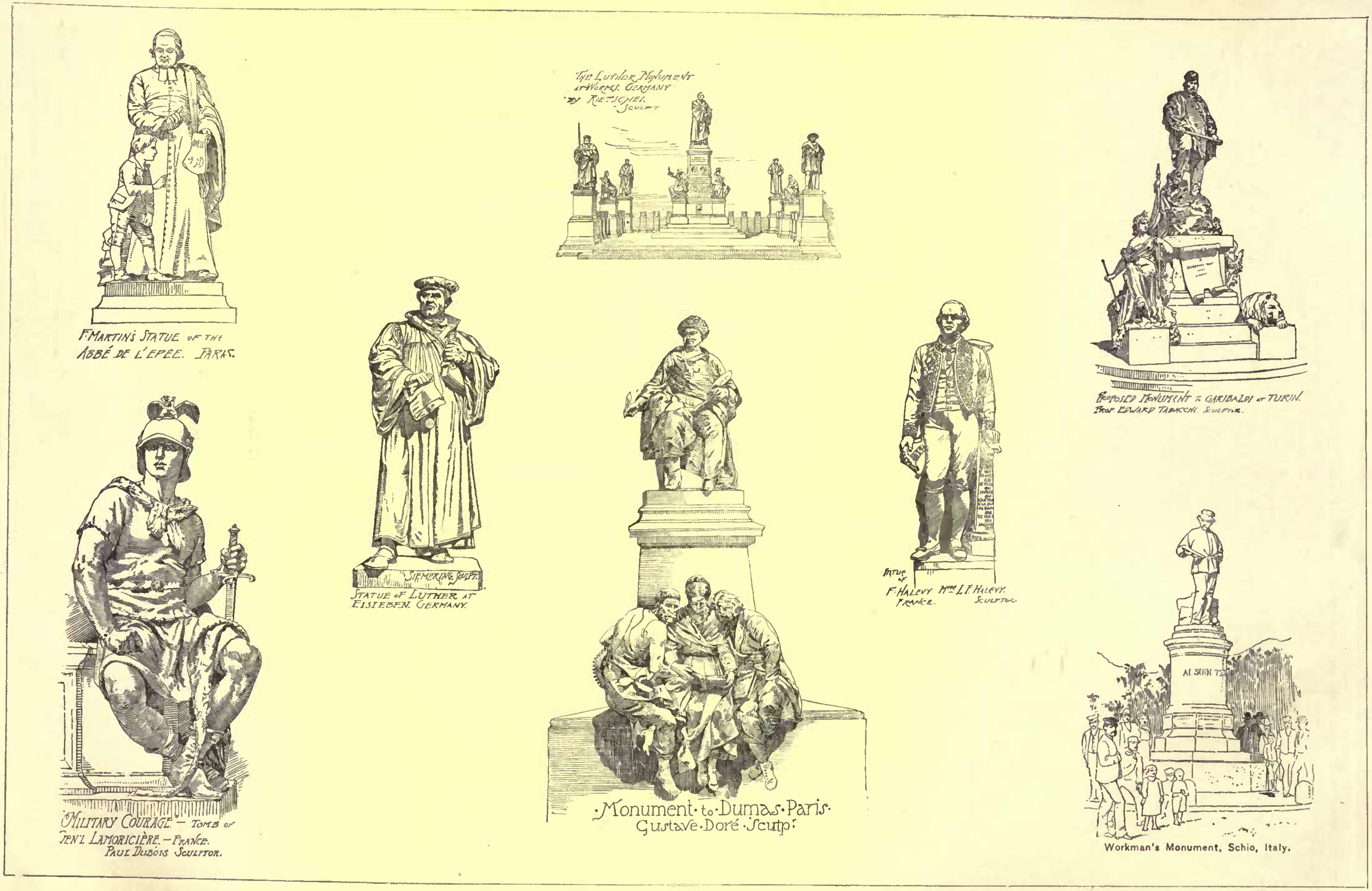
The Frelinghuysen Monument.—A monument of white granite has been placed over the remains of the late Secretary of State Frelinghuysen in Mount Pleasant Cemetery, Newark. It is an obelisk 40 feet high. The lower base is 9 feet square, surmounted by three more bases, in the form of steps. The inscription stone bears an inscription giving the date of the death and birth of the Secretary, and announcing that from 1861 to 1867 he was Attorney-General of New Jersey, United States senator from 1867 to 1869 and from 1871 to 1877, and Secretary of State of the United States from 1881 to 1885.

French Masonry.—The walls are generally built solid, and the method of working and fixing is different from that followed in England. The masons are divided into two classes: first, those that take the rough block as it comes from the quarry, two men generally working together sawing and roughing out, and making beds and joints. The principal tools used are the axe and a kind of drag, formed out of a piece of wood about 8 inches by 3 inches, with six pieces of saw-plate inserted. The prepared stones are taken by laborers to the lift, which is in most cases a square, fixed scaffold with patent crab at bottom, which can be worked by hand or steam power. These scaffolds are fixed at the commencement of building to the intended height, and are built of timber from 8 to 10 inches square, braced with bolts and dogs. The stones are drawn up to the height required, and are then rolled from the scaffold to the wall, and placed in by means of bars, no other appliances being used. This is certainly no improvement on the English system of fixing. The beds and joints are rough and large, varying from ½ inch to ¾ inch. In fixing and working the men do not regard the position of beds and joints. These often come close to the nose of architraves in the centre of pilasters and close to breaks. After the wall is built they start from the top of the structure and work down. The masons who do this part seem to be very good workmen, finishing their work quite as well as English masons. Their tools are similar, excepting that they use planes which are formed to suit any kind of moulding. These tools would not answer for English soft stones, which are more subject to veins and bars.— *W. Pyle.*

A new Painting found at Pompeii.—Mr. Eustace Neville Rolfe, in a letter to the *Times*, dated Naples, August 23, says: "An important painting has been found at Pompeii, and was recently placed in the Naples Museum among the Pompeian frescos. It represents the "Judgment of Solomon," and is the first picture on a sacred subject, the first fragment either of Judaism or Christianity, that has been discovered in the buried cities. The picture is 5 feet 6 inches long, and 19 inches in height, and is surrounded by a black line about 1 inch in width. The scene is laid upon a terrace in front of a house adorned with creeping plants, and shaded with a white awning. On a dais (represented as being about 4 feet high) sits the king, holding a sceptre, and robed in white. On each side of him sits a councillor, and behind them six soldiers under arms. The king is represented as leaning over the front of the dais towards a woman in a green robe, who kneels before him with dishevelled hair and outstretched hands. In the centre of the court is a three-legged table, like a butcher's block, upon which lies an infant, who is held in a recumbent position, in spite of his struggles, by a woman wearing a turban. A soldier in armor, and wearing a helmet with a long red plume, holds the legs of the infant, and is about to cleave it in two with his falchion. A group of spectators completes the picture, which contains in all 19 figures. The drawing is poor, but the colors are particularly bright, and the preservation is excellent. As a work of art, it is below the average Pompeian standard, but it is full of spirit, and drawn with great freedom. The bodies of the figures are dwarfed, and their heads (out of all proportion) large, which gives color to the assertion that it was intended for a caricature directed against the Jews and their religion. This may be so, but my own impression is that the artist was anxious to develop the facial expression, and, to do this, exaggerated the heads. There is nothing of caricature about it in other respects."

TRADE SURVEYS

Trade developments are both encouraging and disappointing according to the standpoint from which they are viewed. The volume of business, according to all the sources of information available, is increasing week by week. Clearing-house exchanges make a favorable showing though there is room for improvement. The accidental exportation of gold possesses no significance. The volume of money seeking investment continues large. A few moderate railway loans have been effected, and building will begin in earnest on four or five enterprises early in July. The trunk-lines between New York and Chicago will lay quite an additional mileage during the third quarter of the year, with the view of making their territory more productive of paying traffic. The change of gauge on the 12,000 miles of Southern roads marks an era in railway development. Quite a number of small enterprises are projected in the Southern States, as in the North, for the building of short lines, particularly in Georgia, Alabama and Florida. The more intimate connections between the Southern railroad systems on both sides of the Mississippi will engage the early and earnest attention of railroad capital. Careful authorities base a great deal of favorable prediction on promising railroad enterprise. Railway material is being ordered with freedom. The locomotive builders have much more work than early in the spring, and the assurance of plenty. A great deal of car work and repairing work generally is creating additional demand for labor. Steel-rail mills have more orders on their books than for years. The bridge-builders are busier than ever, but have very little business ahead, builders preferring to order material as wanted. The wrought and cast iron pipe makers have more business than they can conveniently handle. The puddlers and other skilled mill labor will demand a ten per cent advance west of the mountains, and a seven per cent advance east. The blast-furnace interests are beginning to question whether they are not crowding too much iron on to the market, and the bare possibility of it is checking demand for forward delivery. Prices are firm throughout the iron trade. Hardware manufacturers are busy, but prices have been cut lately. Tool and implement makers are quite busy in the Western States, and advices as late as the early part of this week showed a steady improvement in orders for agricultural implements. Wood-working machinery is active, but competition has about destroyed margins on standard goods. There is, in short, an enormous consumption and a very graded production. Manufacturers in all avenues of production have been warned against over-production. The custom is growing now of ascertaining, approximately, at least, the consumptive requirements in each branch. Great care is taken to get at the facts. This feature of business is a guaranty against wild production. Production is being intelligently organized and controlled, and coöperation is readily assented to, so that competition in the long run is being placed under control. The labor question is more settled. Employers while organizing quietly are accepting arbitration and acting by its desires. The spring strikes have seemed to show employers where they stand. The urgent need of some sort of federation and the necessity of obedience to some higher will than the individual will of each. This good work will be pushed to its logical conclusion. The bituminous strike is over. Anthracite is weakening. Production is ample, and demand is not urgent. The mid-summer season is not far off. Building activity is surprising, considering the intimidations thrown in its way. Low prices for material prevail everywhere. The nine-hour agitation has not produced serious results, and the eight-hour movement is practically a failure. Organized labor is re-organizing itself and endeavoring to place itself in accord with the spirit of the age. Strikes and boycotts are not to be encouraged or in fact tolerated except as a measure of self-defence in extreme cases. Labor means this. Congress has done very little harm and will adjourn without laying rough hands upon the industrial interests. The country is working out of old into new conditions, and it is too soon for hap-hazard legislation to attempt to create harmony between the half-completed developments. The general trade movement is fair. The trunk-line managers keep faith. Western roads also manage to maintain the outward semblance of peace. The iron, lumber, petroleum and other great interests are troubled only with the abundance of crude products. In spite of low prices much machinery is going up, and capacity of all kinds is increased. This observation applies to textile and iron interests particularly. Engines, boilers, machinery of all kinds, tools, and appliances are being produced with an activity and energy which forbids predictions of depression in trade and industry.



EUROPEAN STATUES.

The American Architect and Building News.

Vol. XIX. Copyright, 1886, Ticknor & Company, Boston, Mass. No. 546.

JUNE 12, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS.

THERE is something bewildering in the idea of a "hemispherical" exhibition which the "three Americas" shall join in holding at Washington, in honor of those intimately correlated events, the adoption of the Constitution of the United States in 1789, and the discovery of Cat Island in 1492, and yet it is this kind of geometric festivity which is suggested by the resolution introduced in the United States Senate by Senator Gorman, on April 21, and referred, with evident propriety, to the consideration of the Committee on the Library! Thanks to the impossibility of making an adjective indicative of our standing as citizens of the United States, we have come to be considered, by ourselves at least, and possibly by foreigners, as the sole and only Americans, and it is like falling into a cold bath to be told that our America is only one of three. It is geographically confusing, too, to attempt to discover the two other members of this trinity. The only solution occurring to us is to apply a process of exclusion, and imagine that the promoters, foreseeing our present complications with Canada, thought that British America would not care to be considered as a member of the proposed happy family; so Central America, South America, and that greatest America of all, since its States are the homes of the only Americans commonly so-called, must be the three intended, and they are the ones considered in the exceedingly rambling memorial which Senator Gorman — not the author of it, be it to his honor said — presented with his resolution. The ingenuity with which it is sought to assure the permanency (a prime factor in exhibition programmes on this side of the ocean) of this congress of "sixteen American republics," by having its opening take place March 4, 1889, and its culmination deferred till October 11, 1892, is certainly all-embracing, and is only equalled in audacity by the impudence of the argument that the Capitol and all the present public buildings will form "a magnificent nucleus for the still grander exposition of 1889 and 1892." There seems to be only one edifice now standing which commands the respectful admiration of the promoters of the scheme, and admirers of the absolute beauty of sheer height will be grateful to learn that the space around the Washington Monument is to be reserved for the buildings of the "fifteen [this time] sister republics," on the condition that these buildings, while forming "an appropriate surrounding" for the monument, shall not "obstruct its view from the Capitol and Executive Mansion." It has been computed that the citizens of the "three Americas" spend annually in Europe, for travel, pleasure, education and so on, nearly two hundred million dollars, and in view of this authoritative computation we do not wonder that the promoters propound, though they do not satisfactorily answer, the question: "Why not make the art, educational and other attractions and advantages of Washington such that a large portion of this enormous capital will be kept at home, and European travel and capital attracted here?" To us this seems a very profound conundrum.

BUT apart from the spread-eagleism of the memorial, the suggestion is worthy of consideration and ultimate adoption, if the idea of permanency be abandoned, except so far as it may be represented by the preservation of a few of the buildings erected for the private national celebration in 1889, so that they may be used during the greater hemispherical affair. Ever since the success of *the* Centennial Exhibition, it has been apparent that there would be an exhibition in 1892, in honor of Columbus's pluck and good fortune; and within the last year or so, both St. Louis and Chicago have taken steps looking to the holding of such a celebration in each of those cities. Moreover, the city of Mexico has been innoculated with the same fever. As for the centenary of the adoption of the Constitution of the "parent republic" as the fifteen sister republics—there seems to be some doubt as to the exact degree of relationship existing between the republics which compose the three Americas — are said to consider the United States, a bill was recently introduced in the Senate providing for a world's fair to be held in its honor at Washington, and steps have been taken for a similar celebration in New York. Senator Gorman's resolution, which seeks to combine these two celebrations, seems to us a clever device for making of no avail the earlier activity of the other cities mentioned. The details of the scheme as stated by the memorial are not worthy of consideration, with one exception, and this of local rather than national or international interest: it is proposed that after the exhibition buildings, of such magnificence of aspect as to make the present public structures of the city mere side-shows, shall have covered the space extending from the Capitol westward to Fourteenth Street, they shall then spread over the large territory of the Potomac flats, which must be reclaimed before they can become serviceable for this interesting occasion. If the long-talked of and deferred reclamation of these flats, comprising about one thousand acres, which is expected to go far toward extinguishing Washington malaria, can be in this way brought about, the good citizens of the capital will have enough to rejoice over, even if they find, to their disappointment, that in spite of having taken care to keep the beauty of the Washington Monument unblemished, the tide of holiday travel does not set permanently toward Major L'Enfant's city, rather than across the Atlantic.

THERE is only one surprising thing to note in that portion of the career of Mr. Charles A. Buddensiek which immediately preceded what we sincerely hope will prove his final incarceration at Sing Sing, and that is his inexplicable forbearance in neglecting to jump his bail, which seems evidently to have been what he should have done, according to the New York code of morality. Either the man has some germs of honesty in his composition, or else his imagination has been unduly excited by the newspaper descriptions of the pleasures enjoyed by Messrs. Ward, Fish and others who have money at their command. It is not finally assured, however, that he may not soon be once more at liberty, for, though six of the judges denied the motion to allow his case to be carried before the Court of Appeals, the seventh and last of the bench, having advised with the chief justice, has consented to hear counsel at Saratoga on June 23, so that there is a possibility of the scamp's escaping on a technicality after all. We have not heard that any of his buildings have tumbled down within the last few weeks, but, really, so little material seems to have been used in their construction that a row or two of them may have fallen without making noise enough to attract attention. But in other parts of the country, buildings have recently borne crushing testimony to the inability of their builders to make them stand up. The latest instance of congenital weakness is that of the late opera-house at Alliance, O., called opera-house probably because no one ever had sung or dreamed of singing an opera within its walls. This building, like other opera-houses of its class, was in its various parts used for offices, stores and so on, which were at the time of the

dissolution of the edifice occupied by about a dozen persons, who all escaped uninjured. The building was about eighteen years old, and it is not surprising, in view of its advanced age, to learn that it had been several times condemned, nor to find that the account of the accident closes with the stereotyped statement the "builder had meant to begin the repairs the next day."

ACCORDING to the *Builder*, the former subjects of the Duke of Brunswick, not content with making their sovereign's existence a burden to him while he lived, have in contemplation the removal of the house which his ancestors handed down to him, and which seems to remind them disagreeably of their relations with him. To every one except the unsentimental citizens, the castle of Brunswick is an object of great interest, surpassing perhaps in this respect any building of the kind in Europe except the Tower of London, and the students of history are bestirring themselves to prevent its destruction. The oldest portion of the castle, as it now exists, dates probably to the eleventh century, when Dankward, a descendant of the savage Saxon Witikind, who fought with Charlemagne, built a house which was named from him Dankwarderode. The heiress of Dankward married the Emperor Lothair, a descendant of Charlemagne, and transmitted Dankwarderode to their daughter Gertrude, who married the representative of the Italian family that had come into possession of that province of Bavaria and Saxony which her paternal ancestor, Charlemagne, had carved out of the domains of her maternal ancestor, Witikind. The son of Gertrude was the renowned Henry the Lion, who made the name of Guelfo, or Guelph, as it has been Anglicised by his descendants, the reigning family of England, known and feared throughout Europe. In 1666, just a century after, William the Norman invaded the country which his descendants, mingling their blood later with those of the Lion, were to hold, perhaps for a thousand years, Henry took up his residence at Dankwarderode, and enlarged Dankward's house into the huge castle which still overlooks the five communes of Brunswick. In the middle of the courtyard, facing the grand *perron*, or entrance stairway of the castle, he set the antique bronze lion, brought from Constantinople, which became later, from its associations, one of the most famous pieces of sculpture in the world, and to this day remains in place, contemplating the changes which take place so rapidly around it. Before the building operations were completed, the Lion of Saxony was summoned to assist his suzerain, the Emperor Frederic Barbarossa, in his wars against the Pope, and on his refusal to do so, the Pope's partisans in Italy, to show their gratitude, assumed the name of Guelphs, which they retained long after its origin had been forgotten. In Germany the Ghibellines, or followers of the Emperor, were much more numerous than the friends of the Pope, and Henry the Lion was summoned before the Diet of the Empire, which condemned him to be deprived both of Bavaria and Saxony, leaving him only his private or "allodial" estates of Brunswick and Lünenburg. This change of fortune did not overwhelm the Lion or his descendants, and for a hundred years Dankwarderode was the scene of continual festivity and princely hospitalities; but on the failure of the direct line of descent, the castle, through the operation of some ancient treaties of mutual inheritance, became the common property of all the various branches of the family, no one of which would permit any of the others to occupy it, and as none of the heirs would undertake the repairs which were the common duty of all, the castle was left to the destructive influences of the elements for four hundred years, until it was ceded to the Prussian Government, which sold it in 1878 to the municipality. The latter, finding it convenient to lay out streets through the halls of the Guelphs, ordered their removal, and unless the scholars of Germany possess more influence than they have ever had here, the work of demolition has probably been already commenced.

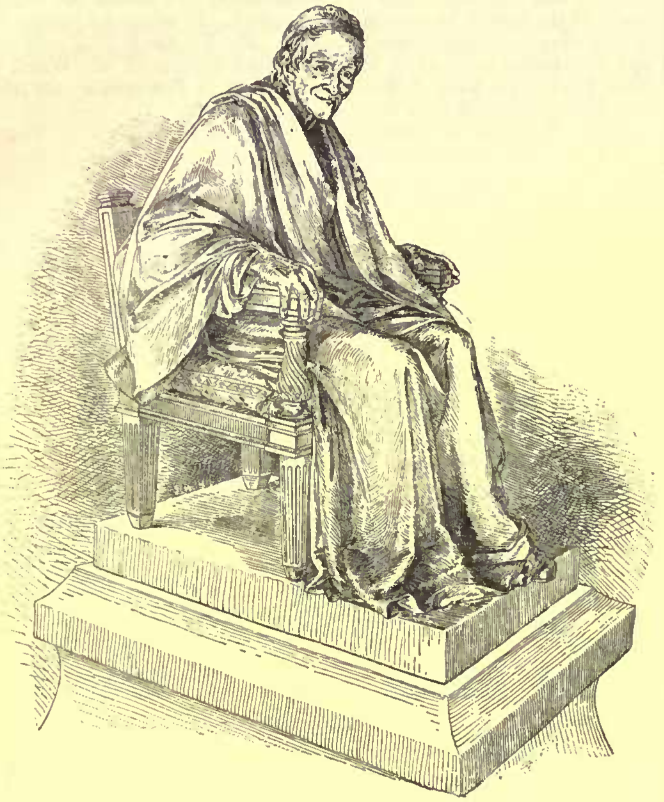
WE have so frequently extolled the fairness with which competitions are conducted in France that our readers may find it refreshing to learn that even there established usage is set aside, and the preference and recommendations of a profession, better recognized than it is here, ignored either by reason of bureaucratic ignorance or ill-disguised chicanery. The programme for the competition for designs for the International Exhibition buildings for 1889 surprised possible competitors by allowing just *fifteen days* for the study and execution of drawings for buildings which are to cover the Champ de Mars, the Esplanade of the Invalides, the gardens near the Palais de l'Industrie and the intervening quays. The plan must indicate the position of M. Eiffel's one thousand-foot iron tower, and permission is graciously accorded to those who have time and inclination to submit an alternative plan which omits the tower. Three first prizes of eight hundred dollars each, three second prizes of four hundred dollars each, and six third prizes of two hundred dollars each are offered and the twelve prize-winners alone will take part in the final competition *if* it is thought worth while to have such final competition. The minister of commerce and industry reserves to himself the absolute right to do what he chooses with the twelve prize designs and guards to himself with the utmost stringency the right to do under every and all circumstances precisely as he sees fit. As may be supposed, the French architects are not slow in voicing their protests, and the protest of an excited Frenchman is usually very lively and amusing reading.

ONE of the greatest needs of our cities is a wholly satisfactory material for paving. Many cities have grown weary in experimenting with this and that material, and are still casting about for new ideas and methods. Real estate owners on the busy streets find that the matter of noisy pavements seriously affects the rental of their stores and offices, and men with capital invested in team horses direct their drivers to sacrifice quick transit, and take roundabout streets rather than risk injury to their horses by traversing the greasy asphalt, or the equally insecure wooden blocks. The wooden pavements, that had their origin in the West, and sprang into favor a few years ago, largely because of their comparative cheapness, soon proved their unfitness for the uses of heavy travel. Besides the necessity for their frequent relaying there was the difficulty experienced in keeping them down. Like the ghost of Banquo they cannot be depended on to remain "laid," as was strikingly shown not long ago in Devonshire Street, Boston, where a slight flooding of the street caused the pavement blocks to rise and float gaily with the tide. Of the various kinds of asphalt or concrete that are used, opinions differ greatly. Of course much depends upon the particular kind used. Washington, Philadelphia, Cleveland and other smaller cities testify to good results from some forms of asphalt, but in Boston there is a pretty general concurrence of opinion against the material. Teamsters, especially, condemn it loudly. In Detroit, there has been an experiment on a small scale with a hard brick pavement which is said to have stood the test of heavy travel with considerable success. The smoothness of this surface, however, it would seem, must be a serious drawback, if generally adopted. A material that is coming into favor in Western cities is crushed Michigan granite, which has the quality of readily cementing itself and proving very durable, while making a roadway sufficiently smooth to obviate undue noise. Its expensiveness is one argument against its more general adoption, but cheap and experimental pavements have certainly had as much attention as they deserve.

IN certain parts of London the intermittent system of water supply, which consists in allowing water to flow through the street mains only at night, is still practised, although its inconveniences and dangers have formed the theme of hundreds of warnings. Not long ago the list of these inconveniences and dangers was swelled by the relation of a new misfortune which had overtaken a citizen of one of the intermittently supplied districts. This gentleman observed that the water flowing into his tank was charged with illuminating gas, and found, on further examination, that whenever the water began to run through his service pipes, its appearance was preceded by a rush of gas, which escaped into the air about his tank. There are certain obvious objections to the delivery of gas and water through the same pipes into dwelling-houses, and the citizen made complaint both to the gas and water company. Men were sent to trace the course of the pipes, and discovered that in one place the water-pipe passed through a portion of ground saturated with gas from a leaky main. When the water was shut off in the morning the street pipe was emptied, and into the vacuum so made the gas was drawn with great force from the pores of the surrounding earth, to be subsequently pushed upward and driven into the houses on the return of the water.

SITTING STATUES.[1] — III.

JOHN HARVARD. I.



Statue of Voltaire, by Houdon, in the foyer of the Theatre Francais, Paris.

THE ideal sitting statue in bronze of John Harvard, the founder of Harvard University, placed near Memorial Hall on the college grounds, was unveiled October 16, 1884. It was given to the University by Mr. S. J. Bridge, a descendant of one of the early settlers of Cambridge, who had also given the preceding year, to the city of Cambridge, a standing statue in bronze of his ancestor, John Bridge.

The statue of Harvard was modelled by Mr. D. C. French, the author of the "Concord Minute-Man." The following description of the Harvard, is from the Boston *Daily Advertiser*. "The figure is more than life size, and represents a tall, slender man, with a beardless face and flowing hair, in position of thoughtful repose. There has been no effort to present a portrait, since but little is accurately known concerning Harvard's personal appearance; but the serious and scholarly character of the man is represented with felicity. The costume is that of the Puritan gentlemen of the seventeenth century, and is treated with a skilful eye to the best effect. The broad collar, the skull cap, belt, knee-breeches and rosettes upon the shoes have afforded a welcome opportunity to escape the stumbling-block of modern clothes. The countenance is that of a scholar. The right hand lies upon an open book placed on the knee, and the left hand reposes upon an arm of the chair. The hands are thin and nervous; they are closely studied, and harmonize well with the general conception of the figure. The chair is a solid carved arm-chair, upholstered with stamped leather. The folds of an ample cloak which is thrown about the figure fall to the floor; two books are laid under the chair, and all these details are executed with marked success."

Other papers have spoken very enthusiastically of the statue. It has been generally received with approval, and, so far as we have heard, with but few serious adverse criticisms.

The Rev. George E. Ellis in his address at the dedication of the statue observed: —

"Let us remember that the ideal can never transcend the real, though many light sayings assert the contrary. The gifted artist has wrought for us here an engaging and a beautiful object. Alone, in his work-room, through the dull days of a whole winter, he was moulding the moistened clay in patient study, imitating the creative work by which man was fashioned out of the dust of the ground. And so far as man's highest gifts can complete the process, he has breathed into it a living soul. It holds the eye and thought gazing upon it in form, lineament and feature."

"It shows us a young scholar in the academic costume and garb of his time, with the refinement and gravity of pure high-thinking. Gently touched by the weakness which was wasting his immature life, he rests for a moment from his converse with wisdom on the printed page, and raises his contemplative eye to the spaces of all wisdom."

With reference to the propriety of an ideal representation of John Harvard, the orator further remarked: "Reverence, love, gratitude and honor have combined to enlist genius in their service, that there may be a personal memorial of Harvard on these grounds, which his living feet doubtless often trod. There is not known to be extant a portrait of any delineation or description of his personality, his form or features. Is not the prompting, however, fair and allowable that there should be some artistic memorial of him on these grounds?

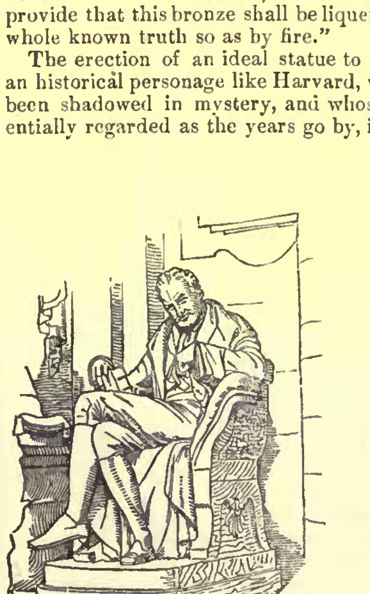
"Let it be distinctly and frankly avowed, for record on this precise day of the unveiling of a statue as a *simulacrum* of John Harvard — so that only wilful error or a fond, mythical invention can ever mislead or falsify a generous and grateful prompting — that this exquisite moulding in bronze serves a purpose for the eye, the thought and sentiment, through the ideal in lack of the real. We have enlisted one of the noblest of the arts to embody a conception of what Harvard might have been in body and lineament, from what we know that he was in mind and in soul. It is by no means without allowed and approved precedent that in the lack of authentic portraitures of such as are to be commemorated, an ideal representation supplies the vacancy of a reality. It is one of the fair issues between poetry and prose. The wise, the honored, the fair, the noble and the saintly are never grudged some finer touches of the artist in tint or feature, which etherialize their beauty or magnify their elevation, as expressed in the actual body, the eye, the brow, the lip, the moulding of the mortal clay. To flatter is not always to falsify. The Latin *simulacrum* and the Greek *eidōlon*, alike divide their significance between a faithful presentation of a real or a conceived likeness, and the creation of an unsubstantial form. It is but a following of the principle of adjustment in equity, in the redirection of antiquated trusts, by approximating to the truth and the right. To say nothing of the classic paintings and sculptures of deities, muses and graces, that never had a fleshly embodiment, nor even of the mediæval saints and worthies, the halls and galleries of continental Europe and the corridors of St. Stephen's, Westminster, have freely exercised the imagination of artists who had no certified originals to follow. Were all the busts of philosophers, poets and Cæsars in the museums of Rome, Florence and Naples portraitures from life?"

As to its merits as a work of art in comparison with statues in Boston, he added: "And even when veritable representations of the great and honored dead have been in the hands of the artists, aided by living memories, we need not go beyond the neighboring city to be satisfied that art may fail in skill and truth in dealing with contemporaries as with the long-vanished dead. The late Wendell Phillips did his best to warn posterity against being beguiled by our Boston statues. If the two foremost worthies of our earliest age could come forth to contemplate their own statues, would not the honored Governor Winthrop be more likely to refuse to enshrine himself in that mass of metal in Scollay square, though his own living portrait was put to service in it, than would our reverend founder to express himself in this fair counterfeit of him?"

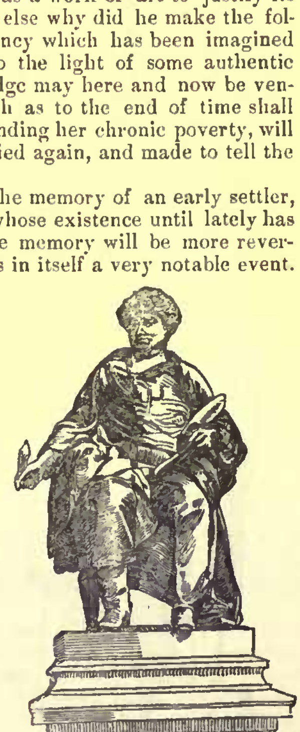
The last sentence is noteworthy, because it is the first time to our knowledge, that a Boston orator, on an occasion of this kind, has ventured to disapprove of Boston statues, or question the propriety of regarding them as masterpieces. The allusions in his address to the sculptor and his work are also noteworthy in that they are exceptions to the custom which orators have universally practised in this country, of pronouncing the statues which they dedicate unrivalled works of art, and their authors the greatest artists living.

The orator seems however to have an uneasy suspicion that the statue is not of sufficient importance as a work of art to justify its preservation under all circumstances, else why did he make the following remark: "And if the contingency which has been imagined should present itself, of the coming to the light of some authentic portraiture of John Harvard, the pledge may here and now be ventured that some generous friend, such as to the end of time shall never fail our Alma Mater, notwithstanding her chronic poverty, will provide that this bronze shall be liquefied again, and made to tell the whole known truth so as by fire."

The erection of an ideal statue to the memory of an early settler, an historical personage like Harvard, whose existence until lately has been shadowed in mystery, and whose memory will be more reverentially regarded as the years go by, is in itself a very notable event.



William Wilberforce, Westminster Abbey. Joseph, Sculptor.



Alexandre Dumas, Paris. Gustave Dore, Sculptor.

With one exception (the Pierson statue at Yale College), the ceremony which took place in Cambridge on October 16, 1884, was unique in American history. An audience, nationally representative in character, locality and sentiment witnessed it. The extremely meagre history of John Harvard formed a prominent part of the

[1] Continued from No. 531, page 102.

dedicatory address, and the unveiling of an ideal image of his living body as the noblest tribute to his memory closed the exercises.

We doubt if half a dozen persons in all the hundreds that gathered around the statue when it became the property of Harvard University, knew that that University's founder was buried in an old graveyard not more than two miles in a straight line from where his bronze counterpart looks westward. John Harvard died in Charlestown, Massachusetts, and was buried on Burial Hill in that town. Until the Revolutionary War, a gravestone was standing over the spot where his ashes repose, but it was soon utterly destroyed, and no attempt was made to replace it. In September, 1827, the Hon. Edward Everett, and a few other graduates of Harvard College, proposed to erect a monument on Burial Hill to Harvard's memory, and to defray the expense by subscription from the graduates of the college, limited to one dollar from each person. The monument was dedicated September 26, 1828, by an address by Mr. Everett, a letter from the President of the United States (J. Q. Adams), and a prayer by Rev. Dr. Walker. It is described as a "solid obelisk, fifteen feet in height, four feet square at the larger extremity, and two at the smaller, and rises from a substantial foundation without a base, from the surface of the ground. It is enclosed by a simple iron railing, surrounding a space nine feet square, and stands in a beautiful and commanding situation. On the eastern face of the shaft, the name of Harvard is inscribed in large raised letters, and this inscription is wrought in a white marble tablet: —



Chief-Justice Story, in the Mt. Auburn Chapel.
W. W. Story, Sculptor.

"On the 26th day of September, A. D., 1828, this stone was erected by the graduates of the University of Cambridge, in honor of its founder, who died at Charlestown, on the 26th day of September, A. D., 1638."

On the opposite side of the shaft and looking towards the University, is an inscription in Latin, also on a white marble tablet. The inscriptions on these tablets have not been legible for many years, and there is nothing on the monument to show that it was erected to the founder of Harvard University.

Nor does the present statue give any clew to its identification with the university, and the pedestal that supports it bears only the suggestive words, John Harvard, Founder, 1638. With a granite



James Otis, in the Mt. Auburn Chapel.
T. Crawford, Sculptor.



John Adams, in the Mt. Auburn Chapel.
Randolph Rogers, Sculptor. 1859.

shaft and a bronze statue set up to keep him in honored remembrance, the curious student has yet to turn to the pages of history, to learn anything about his existence. Popularly speaking, the statue would be called an excellent specimen of American sculpture, and far better than the large majority of statues in Boston and its vicinity. For the reason that it is more human in its character, finer in its idea, and more agreeable in its execution. In almost the fullest sense of the term it is an American statue. It would be wholly so, if its author had never visited Europe. Mr. French is an American, and has studied exclusively with American sculptors; Mr. Ward, of New York; Mr. Ball, of Boston, who lived in Florence at the time Mr. French studied with him, and Dr. Rimmer, of Boston. Mr. French has twice visited Europe, but has not been professionally connected with any foreign artist. So far as study is concerned he belongs to the class of American sculptors who have never pursued, either at home or abroad, what is understood in Europe as a thorough course of professional study. In thus confining himself to the facilities of his own country, the sculptor manifests his content with the verdict of his countrymen concerning the merits of his work.



John Winthrop, in the Mt. Auburn Chapel.
R. S. Greenough, Sculptor.

In character and variety of subject and sufficiency of work he has been peculiarly fortunate. He came before the public in 1875, with his "Minute-man." Since then and until the appearance of the Harvard, he has been engaged in the execution of several colossal groups for Government buildings in various parts of the country, one in St. Louis, another in Philadelphia, and two for the post-office building in Boston.

No American sculptor, since Crawford, has had such complete, extensive and important subjects to treat: ideal, and nationally representative in the largest sense — all executed in this country — all, in their imaginative character, the best possible subjects to prepare the sculptor for the subsequent consideration of such a one as the Harvard. He has also had the advantage of parental connection with the Government, Mr. French, Senior, having been for many years Assistant Secretary of the United States Treasury. No American sculptor has been better circumstanced to study his art than Mr. French.

From the fact that the sculptor has been so completely an American in his studies, in his allegiance to whatever his country could give to assist the development of his taste and talent in sculpture, and especially in his unobtrusive professional life, it would be unjust to criticise his work from a foreign or French point of view, as illustrated by such statues as the "Daumet" and "Voltaire." From an American point of view, as established by the works of Palmer and Ward, no severe, comparative criticism could be made of the statues Mr.



Chancellor Robt. B. Livingston.
E. D. Palmer, Sculptor.

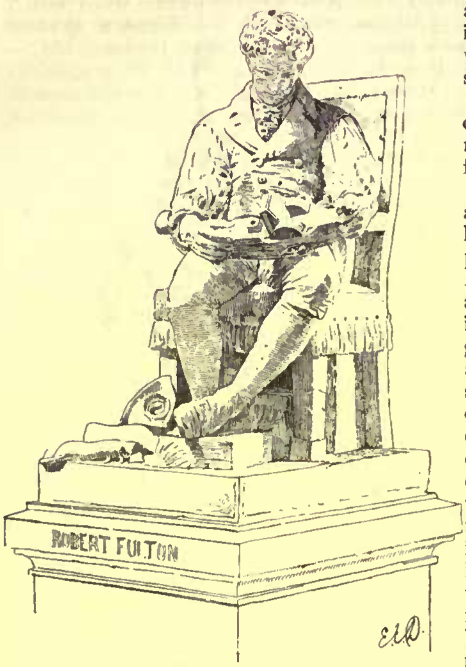


The Pilgrim, in Central Park, New York.
J. Q. A. Ward, Sculptor.

French has executed, because he occupies the same plane with them, though in some respects his work is better, and in others not so good as theirs. The nearest local opportunity for comparing the Harvard with statues by American sculptors is found in the chapel in the Cemetery of Mount Auburn, which contains a sitting statue of Governor Winthrop, by R. S. Greenough; Judge Story, also sitting, by his son W. W. Story; and the standing statues of Otis, by Thomas

Crawford, and John Adams, by Randolph Rogers. The first two represent a kind of work which is called sculpture in this country, and of which it can always be said that it belongs to a past generation.

The painstaking, almost exquisite finish of the Winthrop indicates a refinement of mind in the treatment of marble, that deserves a closer and more intense relationship with a true sense of sculpture.



Robert Fulton, in the Capitol, Washington.
Howard Roberts, Sculptor.

The Story is an excellent example of Roman marble-cutting frigidity.

There is a *style* about the Otis that has not been approached by any American sculptor, and its general scheme is statuesque and elegant. If the John Adams is coarse and strained in its conception, and cold and disagreeable in its execution, it yet has a quality of sculpture that is superior in one respect to any statue in Boston or its vicinity, because it shows that it was studied from a live model, a being that had blood, muscle and action in him. A comparison between the Adams and Harvard, in the matter of refinement would all be in favor of the latter.

None of the statues above mentioned, except the Otis, can compare with that in Mount Auburn Cemetery of Doctor Nathaniel Bowditch, by Ball Hughes, an English sculptor, for simplicity of character, and excellence of composition.

If French's work is not as robust as Ward's, nor as pleasingly skilful in modelling as that of Palmer, it is more definite in idea, and shows a talent for design possessed by neither of those sculptors.

If there is nothing about the Harvard to identify it with a particular individual, it is yet plain to all that it represents a person of scholarly life, and possibly a clergyman.

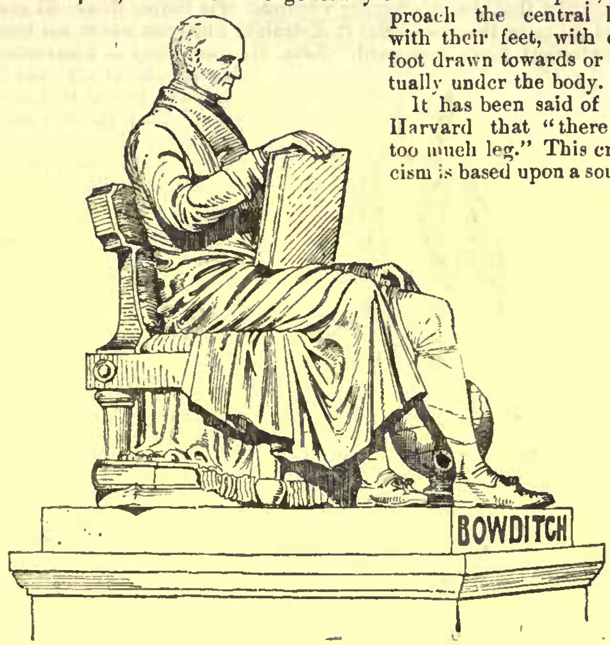
The meaning of the statues by Ward and Palmer is not always evident, and their composition often includes positions of members of the body that are not only in bad taste but are even ludicrous. The action of the left hand of the "Livingston," and of the right arm and hand of the "Pilgrim," are examples.

In a sitting statue of John Harvard, the sculptor had before him one of the highest and most complete subjects in ideal portrait sculpture, and one of the choicest in American history — a spiritual and intellectual man, whose high office was that of a clergyman, and whose most far-reaching thought was outside himself, looking from the background of a savage wilderness forward through centuries of human struggle and suffering to a day of spiritual enlightenment and national greatness. And for a costume he had almost endless possibilities of variety and picturesqueness.


Gov. Winthrop, Scollay Square, Boston.
R. S. Greenough, Sculptor.

If it would be unfair to judge the Harvard by so high a standard as the best sitting statues of the present time in Europe, it is still proper to examine it with reference to certain physical facts that characterize all well-balanced persons who sit well, and also with reference to the relationship that exists between the physical and mental nature of such persons, when their minds are occupied with a definite aim, as is the case with the Harvard.

It is the natural tendency of all persons, both savage and civilized, in a sitting position, to draw the legs near to or under the body, in order to establish the perpendicular or central line of gravity. The arms also seek the centre of the body. The whole natural tendency of a person sitting is to centralize, for physical and mental reasons. And this fact is an authoritative basis for the composition of all good sitting statues. Exceptions to this are found in statues whose legs are covered with drapery, and whose purposes are personal, illustrative, or without a special mental object. Male statues whose knees are wide apart, and which are generally covered with drapery, approach the central line with their feet, with one foot drawn towards or actually under the body.



Dr. Nathaniel Bowditch, Mt. Auburn Cemetery.
Ball Hughas, Sculptor.

It has been said of the Harvard that "there is too much leg." This criticism is based upon a sound principle of nature and good composition. If both legs must be extended from the body, they ought to have been covered, an easy thing to do with the gown, and thus in every way improve the composition. As they are now, they are uninteresting in themselves, form no agreeable composite part of the statue, and, what is still more objectionable, they make an unfortunate variety and effect against the massive background of the chair and drapery.

It is a nice question in the composition of such a subject, whether it was permissible to place the legs as they are, even if covered, in view of the guiding idea of the statue, that of self-forgetfulness.

It has also been observed of the Harvard that "it is not sufficiently concentrated." "The head, legs and arms do not go together."

It is seldom that a thinker, a dreamer, a seer, or a savage, in moments of mental activity or musing, does not bring one of his hands in contact with his head.

Judged by such criticisms as these, the Harvard is sadly at fault. These faults are especially grave in a subject of this kind. With one identified with material or worldly interests of the immediate present they might belong to a harmonious composition and a large style of design. This is particularly true of the arrangement of the arms, the movement of the hands, and the free use of the gown in relation to the chair. All this is a splendid beginning of an imposing effect in a sitting statue, and it makes the Harvard the first sitting statue by an American, with the exception of the Taney, by Rinehart, at Annapolis, that has the true elements of composition.

The physical character of the figure is in excellent harmony with the head. The hands, though appearing a trifle large for a body so delicate, are well understood in themselves, as well as in their relation to the whole statue.

If the sculptor has not made out of this subject all that was possible, it is certain that he has done his best with a rare faithfulness. A general amplitude, almost abandon, pervades every part of the figure. For this, a tendency of design, freedom from strange, illustrative and contrived fancies, and unpretentiousness of work, Mr. French outranks all our sculptors. In comparison with such a tiny effect as the "Fulton" produces, or the uninviting coarseness of the "Buckingham," the Harvard is a masterpiece.

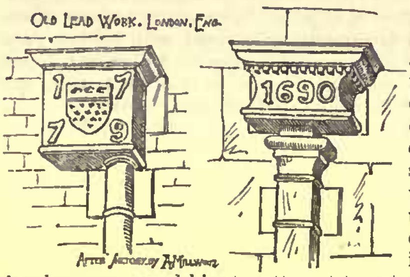
For a comparison between repulsive correctness of modelling and a delicate reproduction of cloth, for the purposes of sculpture, the Everett, in the Public Garden, in Boston, and the Harvard, present extreme examples.

In the head, the dominant, poetic fact of the Harvard has been perfectly understood by the sculptor, and that is of the highest import. The head is finely treated—the best we have ever seen from the sculptor's hands. John Harvard looks out, unconscious of himself and all that surrounds him, into the limitless distance. He may be thinking of his death, soon to come, or of the imposing harvest the seed he planted was sure to bring forth. Either thought is well; both are impressive. T. H. BARTLETT.

[To be continued.]

A LOCOMOTIVE engine on the Reading railroad ran into a wagon loaded with four cases of dynamite and one hundred kegs of powder, knocking the contents in all directions, but with no more serious consequences.— *Iron Age.*

THOMAS A. TEFFT AND BRICK ARCHITECTURE IN AMERICA.[1]



SOMEWHERE about the year 1845, the Hon. Henry Barnard, when State Superintendent of the common schools of Rhode Island, found in one of the country district schools a young teacher in whom, by reason of his unusual brightness and energy, he became greatly interested; so much so that he encouraged him to attempt to get a college education; which purpose was finally effected by his entering an architect's office in Providence, where he earned his support by draughting, at the same time acquiring his profession as an architect, while also taking a course of study in Brown University, from which institution he graduated in 1851 with the degree of Bachelor of Philosophy.

His art powers rapidly developed and he was soon entrusted with much of the preparation of the design and detail of buildings. If he did not originate the design, he certainly had charge of most of the details of the plan of the large railroad depot at Providence, while he was yet a student in the architect's office. This building, as far exceeded in size as in architectural pretensions by other passenger depots since erected in the United States, was at the time the largest building in the country designed for such use. It also possessed some pleasing architectural features, was of good proportion, and, although of brick, there was some slight use of brick in architectural ornament; a timid experiment with a cornice and I think some buttresses, and possibly an attempt at variety of wall-surface.

Whether this first actual attempt at ornamental brick architecture was wholly initiated by the young student, which it is the more likely to have been, as, though called such, his employer was probably not a thoroughly trained professional architect — such comprising an exceedingly limited class of American citizens in those days — but a builder on a large scale, who would trust ornamental details mostly to his talented young assistant; or, that the attention of the student was first directed by this experiment to a consideration of the possibilities of brick architecturally, is unknown by the present writer; but it is certain that from that time it became a settled purpose with this ambitious young enthusiast to develop in America an architecture of brick. Opening an office for himself in Providence as soon as his studies were completed, he prosecuted his profession assiduously. He designed and erected buildings in Providence, Newport, Worcester, Mass., Richmond, Va., and elsewhere.

In 1855 the attention of the present writer, while on a voyage down the Ohio and Mississippi, was arrested by the beauty of proportion of a large brick building standing on the bank in full view of the river, at Cannelton, Ind. As the boat made a short stop there, the building was visited and proved to be a cotton factory! In addition to fine proportion there was evidently some judicious use of ornament in brick, and the building was certainly in delightful contrast with the enormous and ugly piles of brick and mortar, innocent of any attempt at proportion or ornament, which were then the only types of cotton-factory buildings in New England. This was a demonstration that in buildings designed for use ugliness was not necessarily inevitable. Some three years after, when speaking of this building to a friend in Rome, Italy, who had himself been discoursing at length upon the beauty of the brick architecture at Lombardy, he turned and drew from his portfolio the plan of the factory at Cannelton, designed by himself while a student in Providence. This led to his showing me his drawings for the depot at Providence, of which I have spoken, and of several other examples of his architectural experiments in ornamental brick buildings. As soon as the practice of his profession made it possible, he had made a voyage to England, where, just then, the use of color in giving variety to brick architecture was being experimented with, and much lauded; but the knowledge and use of colors by the English was then so crude that the results were simply hideous, while in the ornamental use of brick, architecturally, they had then done but little.

After returning to America he continued his experiments and his researches into the history of brick architecture and determined to see for himself what was left of the early brick architecture of Lombardy, for he was enthusiastic in his belief in the possibilities of brick and terra-cotta, and he held the opinion that if the United States were to have any creditable domestic architecture, it must be adapted to the uses of burnt clay.

He believed that the genius of the artist was the only essential factor of the problem, and that a true architect could erect noble and beautiful buildings, even if compelled to use only the then despised brick.

When I had the good fortune of first making his acquaintance it was in Rome, when he was just returned from his researches in northern Italy. He had given thorough study to the methods and styles of those early Lombard builders, and was in a delightful state of enthusiasm, for he had been wholly confirmed in his first instincts as to the possibilities of brick. Often, in talking with his friend, the sculptor Paul Akers, whose rare genius was wide-embracing, the two would rejoice in prospect of the new opportunities for original work in sculpture, afforded by the possible uses of terra-cotta modelled by sculptors and inwrought into the façades of noble buildings. This use of terra-cotta, which furnishes so ready an opportunity for the possession of enduring forms of art by wealthy owners when having homes or other buildings designed — which was foreseen by these young American artists in those talks in Europe in 1856 and 1857— has, as yet, hardly begun to be appreciated. With its availability for portraiture and for unique original works of art, it would seem to offer to artists and to wealthy connoisseurs alike most attractive opportunities.

Our young architect sought the society of the leaders of his profession, on the Continent and in England, and the writer has the happiness of recalling many a pleasant hour passed with him and the late Owen Jones, the distinguished English architectural innovator to whose genius is to be credited the initiation of some phases of the modern architectural and industrial art movement in England, more especially in the uses of color in buildings and in interiors.

Our young American, somewhat to the regret of his European professional friends, was not exclusively absorbed in a single interest; he had busied himself with studies and researches in political economy, and had prepared a treatise on "a universal currency," read first at Liverpool, before the Social Science Congress, Lord Brougham presiding, which attracted great attention. It was published in the London *News*, and afterwards translated and published in Belgium, France and Italy, winning for its author recognition by Mill and others in England, by leading publicists in Belgium and France, and by Cavour in Italy; so that there seemed some danger that he might be diverted from his architectural plans for America. He always protested, however, that the introduction of an architecture of brick in America was to be his life work; for this he was always seeking to prepare himself.

In addition to the fact that he is, as related, to be ever associated with the first dawning of a distinctively architectural era in the United States, this lamented genius has another valid claim to mention in these pages. On his last voyage to Europe he bore from the Governor of Rhode Island a commission—as "Commissioner of Industrial Art Education for the State of Rhode Island," and he was busy in availing himself of the opportunities freely accorded by the authorities in the different countries, in order to prepare the report on industrial art education in Europe which he was to make on his return home. So it appears that as early as 1859 the State of Rhode Island had in Europe a commissioner busily engaged in preparing such a report. Could we have had this report, anticipating by a decade the action taken by Massachusetts, it might easily have happened that the beginning of industrial art education in the United States would have been credited to Providence, instead of Boston.

In this effort by this young Rhode Islander to investigate European industrial art in the interests of America, may be fairly traced the impulse given by Henry Barnard to his ambitious *protégé*.

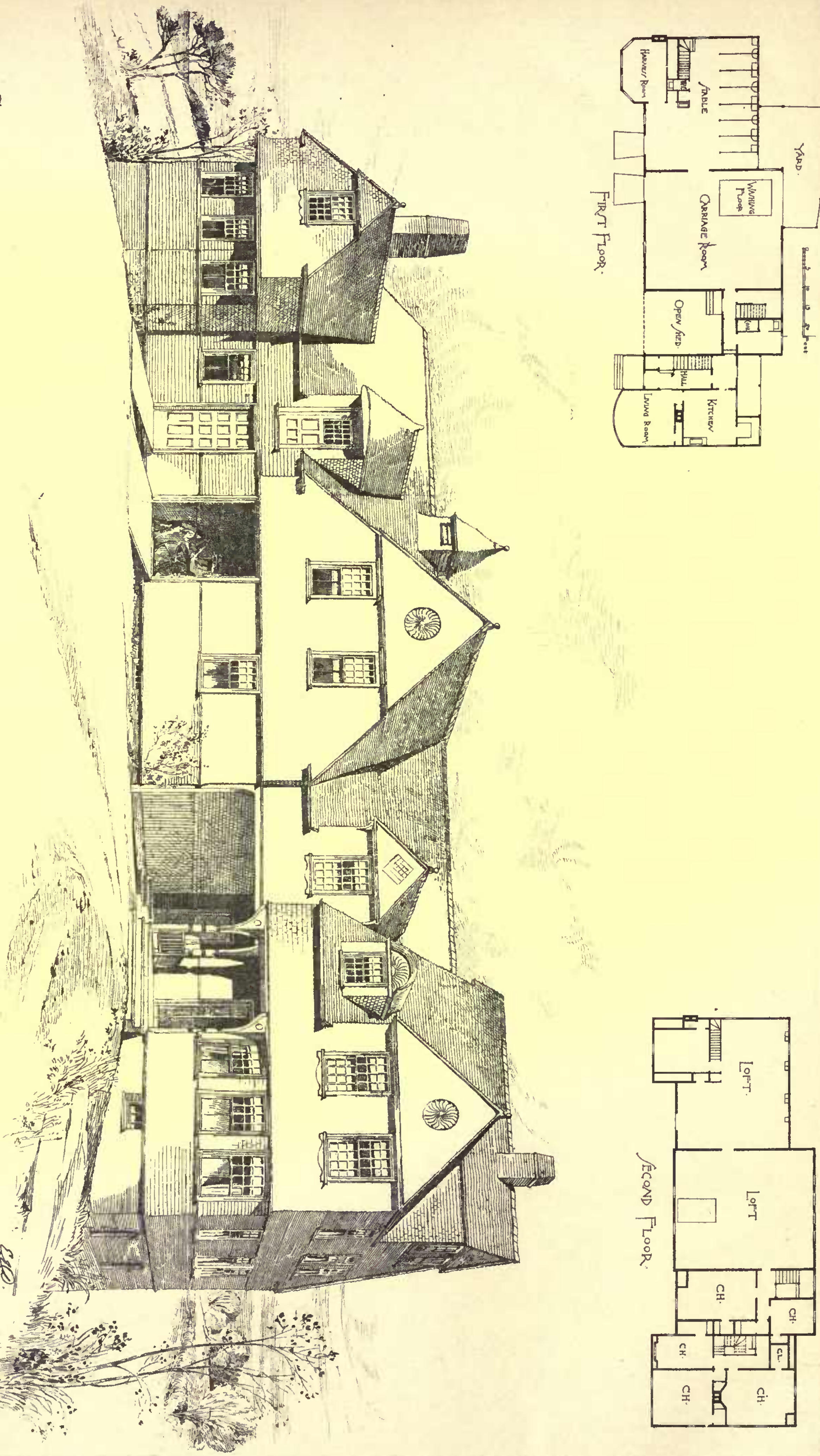
It was while pursuing his architectural investigations in Venice, in 1860, that our student was stricken with the deadly fever fatal to so many Americans. It was in vain that he fled to Florence, where, though carefully ministered to by Mr. Powers and his family, and by other American friends, he survived but a fortnight; when all that was mortal of Thomas A. Tefft, was, by his sorrowing countrymen, tenderly laid to rest under the peaceful shadows of the cypresses without the walls of Florence, in the little Protestant enclosure sacred in the memory of so many English and American hearts. It would be difficult to find, in Europe, a fitter resting-place for this young American architect than is the sunny spot just without the walls of that city whose beauty is the epitome of the art he loved: that city which was the home of Arnolfo, Giotto and Orgagna. He lies almost under the very shadow of Brunelleschi's swelling dome, and where, each day, at "the hour of Ave Maria," the heavenly music of bells, lifted high in their ærial belfry in that "Headstone of Beauty" designed by Giotto to o'ertop the city's clustering towers of watch and war, is floated downward with a softened melody, and in sight of that spire which, above the ashes of Angelo and Galileo, points to the skies.

It is eminently fitting, in view of what he had achieved as well as of what he had planned, that the name of Thomas A. Tefft, late of Providence, R. I., who in his origin, his opportunities, his aspirations, ambitions, energy, industry and versatility, was an embodiment of the best type of the young Americans of his day, and whose life, by its European successes, reflected honor upon his native land, whose homes have since been made beautiful by his idealization of common clay — should be recorded in a work dealing with the progress of the arts in America, and with the development of industrial art education.

Although dead at the early age of thirty-two, and although his achievements in this direction were probably known to but few, he had, nevertheless, impressed himself indelibly upon the architecture of his country, by thus practically initiating and introducing the ornamental use of brick. In addition to the buildings designed by him while an assistant and pupil in another's office, he put up a sufficient number of buildings while himself in the active practice of his profession to vindicate his claim to priority, and to set the example of the use of brick in architectural ornament in so many different places that the innovation was sure not to be overlooked or forgotten.

[1] Extract from the Report of Mr. I. Edwards Clark on "*Industrial and High Art Education in the United States.*" Issued by the Bureau of Education of the United States Department of the Interior.

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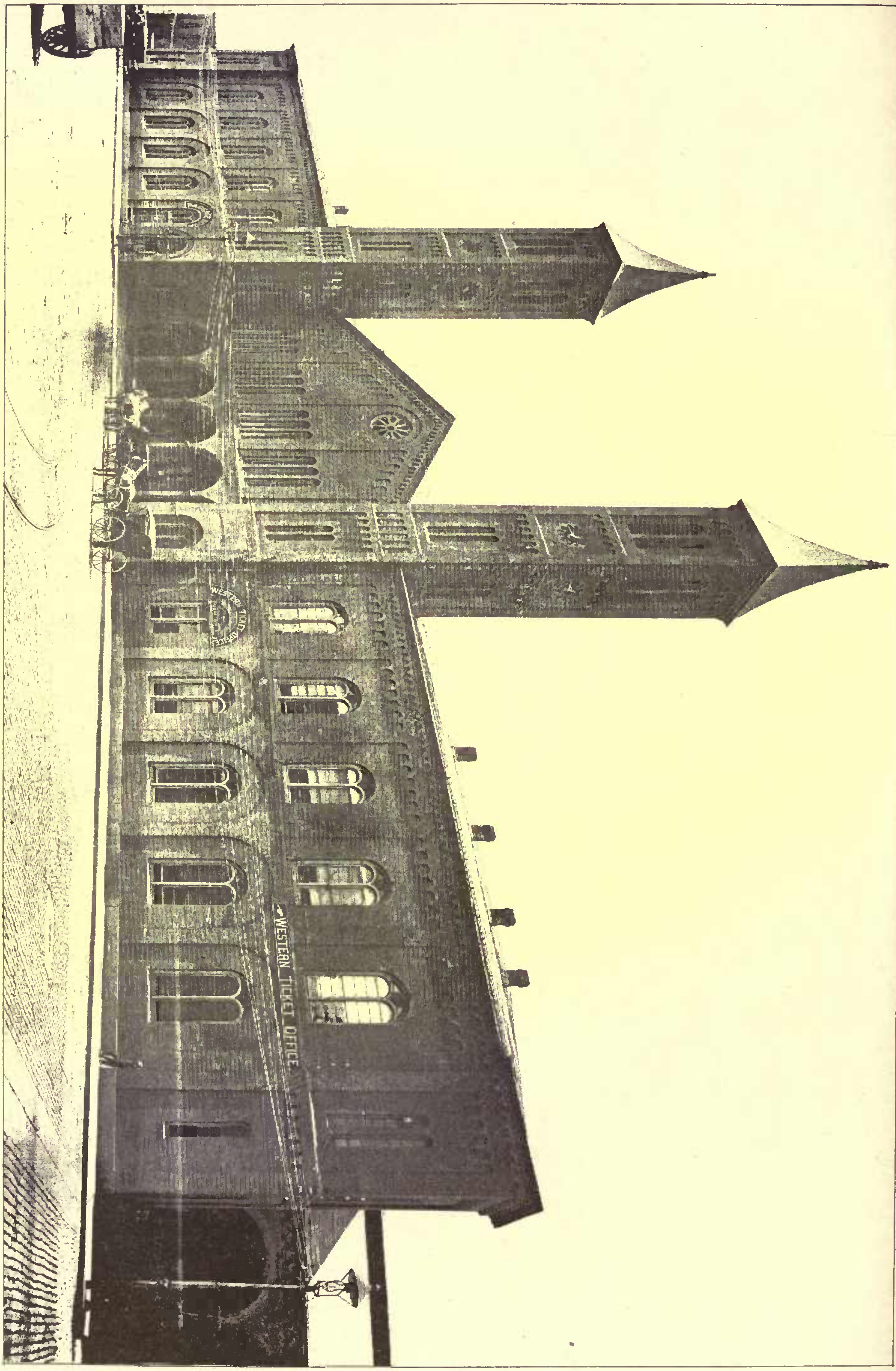


Stable and Coachman's Cottage. Beverly. Mass.

For Mr. Thos. E. Proctor. Messrs Hartwell & Richardson. Archts

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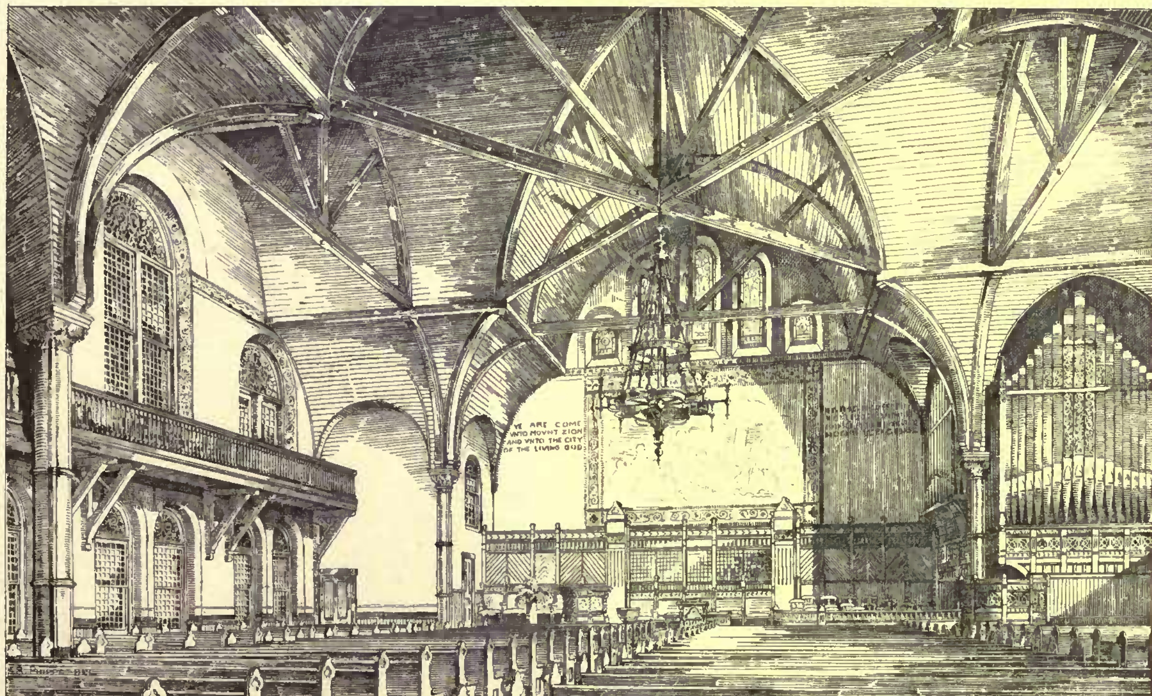


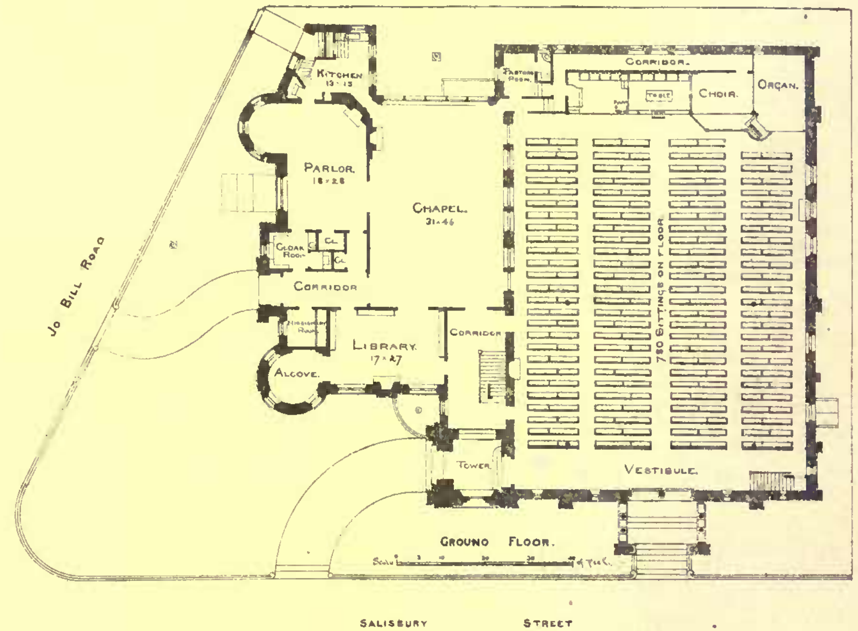
Central Railroad Station, Providence, R.I. — Thomas A. Tefft, Archt.

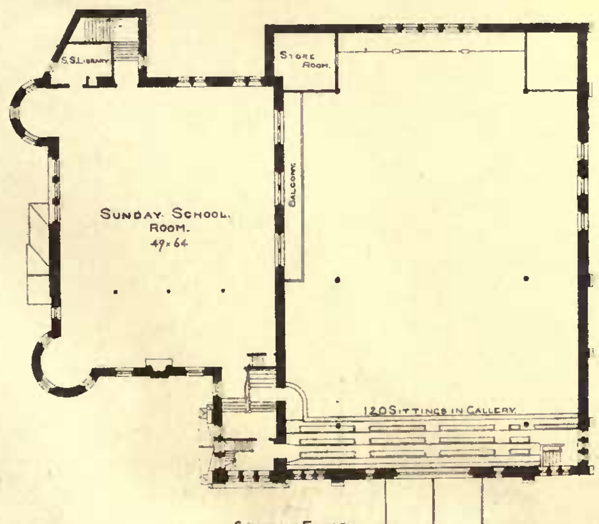
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American Architect and Building News, June 12 1886.

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Central Congregational Church
Worcester Mass.

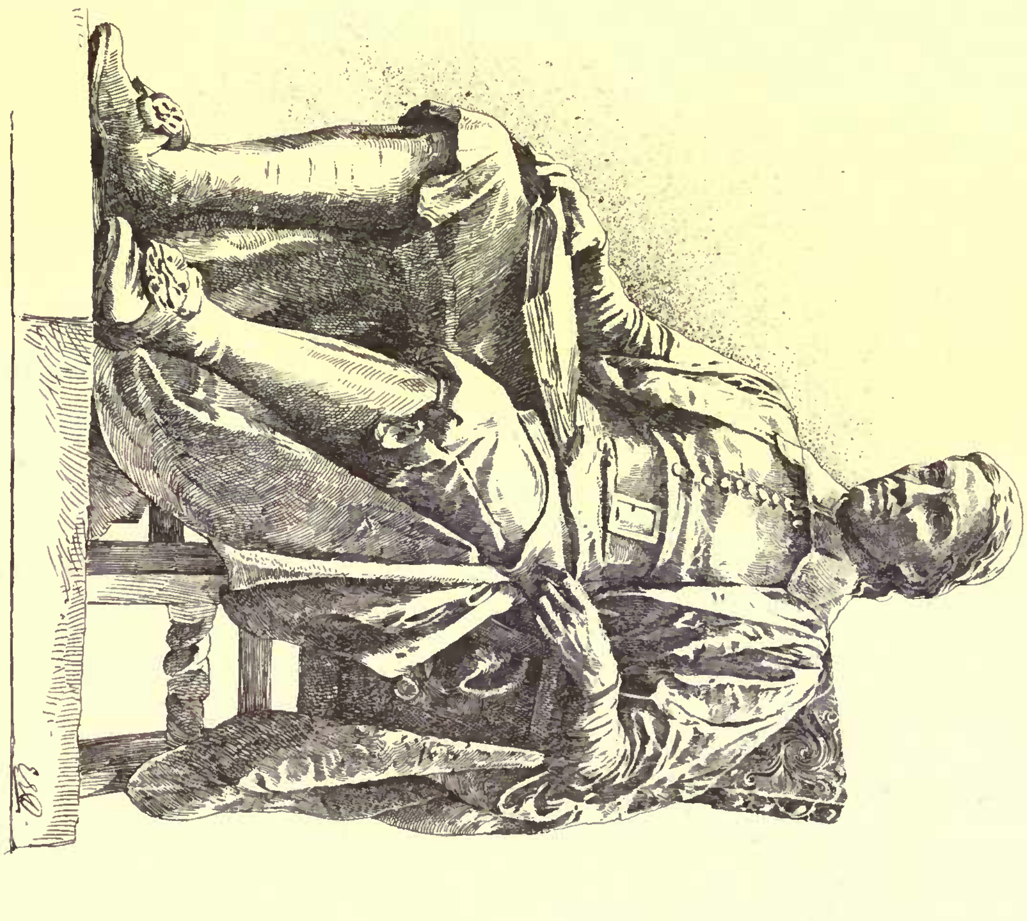
Stephen C. Earle, Architect
Worcester, Mass.

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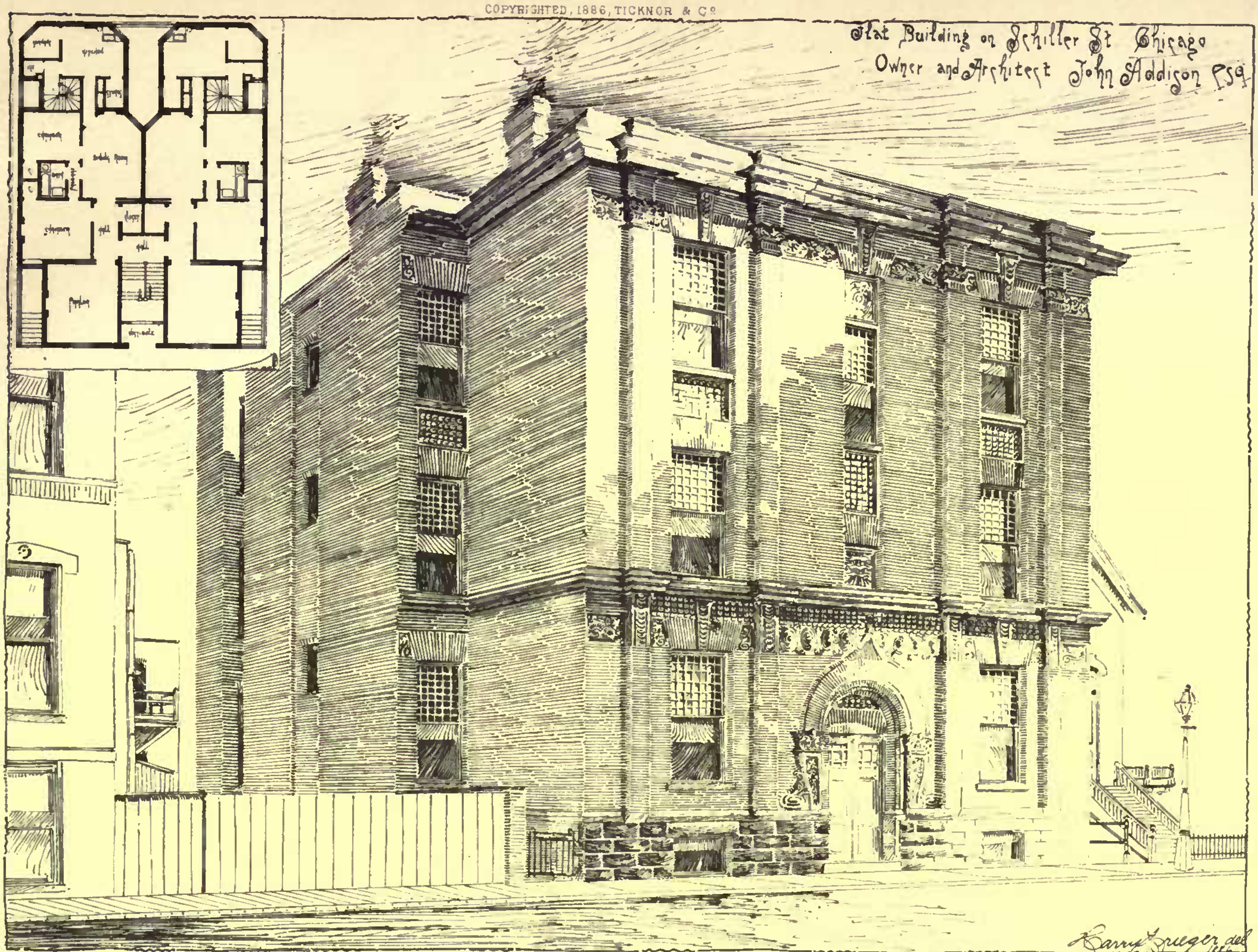
Daumet: Mathematician. Falguière, Sculptor.
at Toulouse, France.

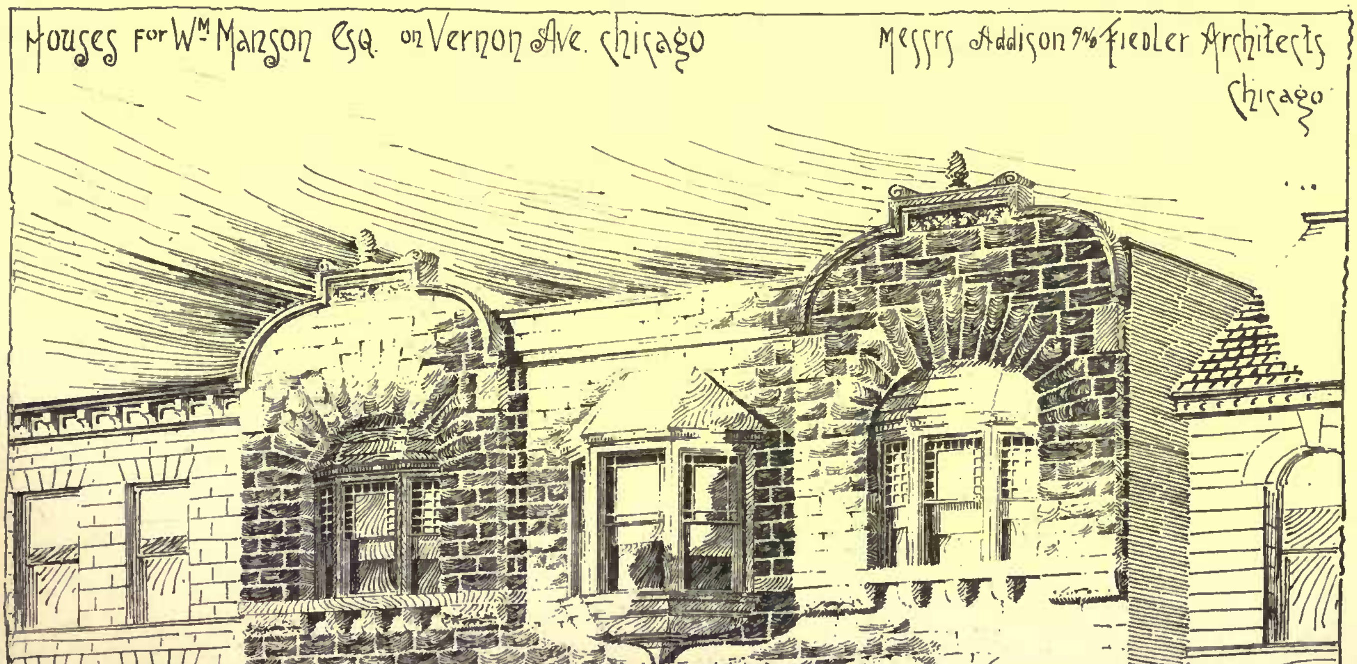


John Harvard. Cambridge, Mass.
Daniel. C. French, Sculptor.

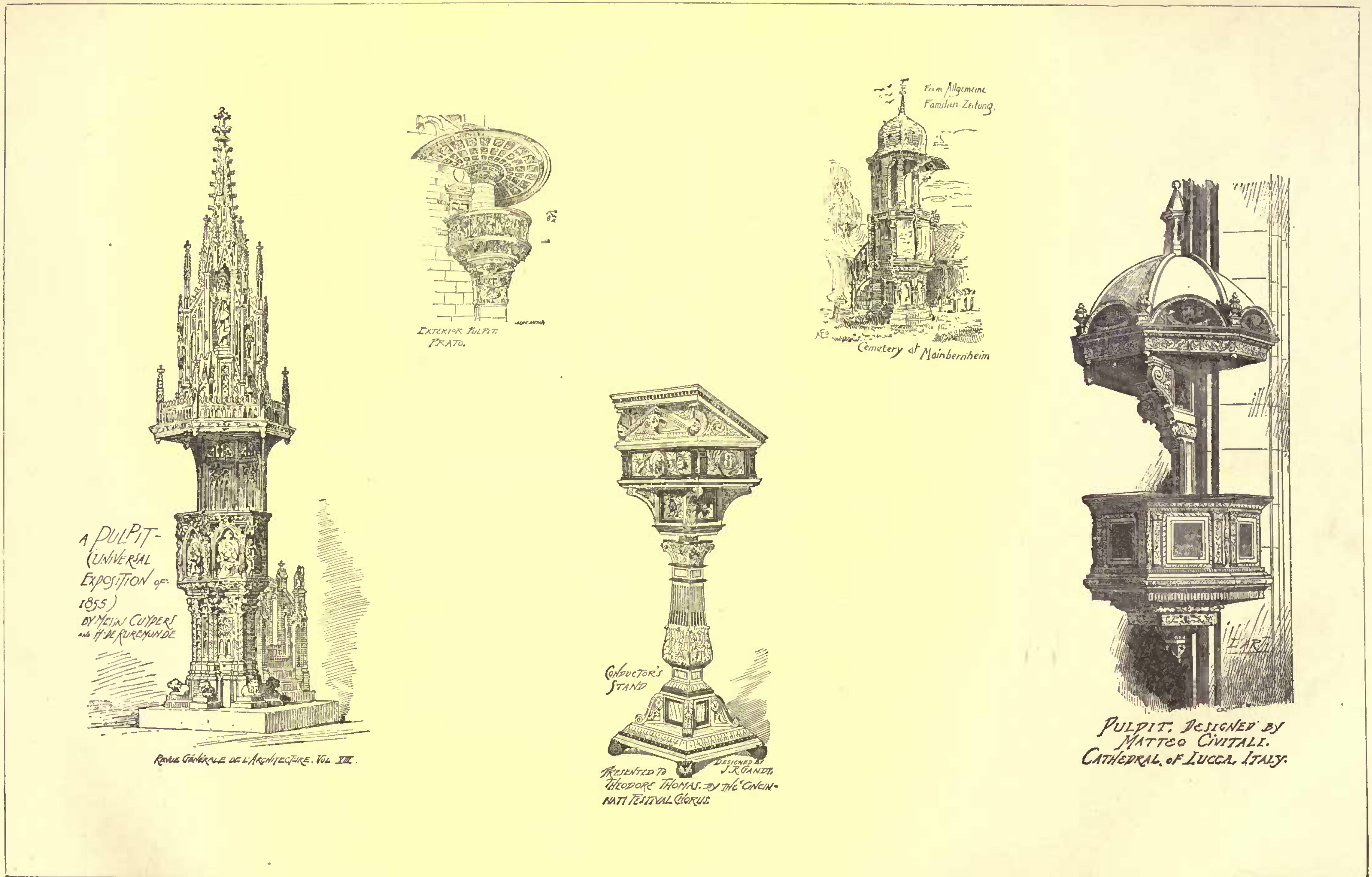
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A PULPIT–
(UNIVERSAL
EXPOSITION OF
1855)
BY MESSRS CUYPERS
AND H. DE RUREMONDE
REVUE GÉNÉRALE DE L'ARCHITECTURE. VOL. XIII.
EXTERIOR PULPIT
PRATO.
From Allgemeine
Familien-Zeitung.
Cemetery at Mainbernheim
CONDUCTOR'S
STAND
DESIGNED BY
J. R. GANDT.
PRESENTED TO
THEODORE THOMAS. BY THE CINCIN-
NATI FESTIVAL CHORUS.
PULPIT. DESIGNED BY
MATTEO CIVITALI.
CATHEDRAL, OF LUCCA, ITALY.

PULPITS.

As similar claims of priority always challenge attention and seemingly invite denial,[1] it is proper to state that knowledge of the facts as here recited was obtained by the writer by personal observation and association, in America and Europe; from statements made and drawings and plans shown by Mr. Tefft; by corroborative testimony received after his decease, from citizens of Providence; and from statements made to me, personally, by the Hon. Henry Barnard.

Mistakes are therefore precluded as to the fact that the late Thomas A. Tefft, B. P., of Providence, R. I., designed and erected brick buildings in the United States, in which brick was used ornamentally, certainly as early as 1850, and probably a year or two earlier, so that there is no room for question that Mr. Tefft was among the first, and probably was himself the very first professional architect in the United States, in recent years at least, to venture upon the use of brick in architectural ornament, as he was the first to enter upon exhaustive investigations in northern Italy and elsewhere, with the definitely announced purpose of effecting the introduction of a specific brick and terra-cotta architecture in America. Others had doubtless visited, examined and enjoyed these works of the early Lombard builders, but Mr. Tefft seems to have been the first architect to apply in the United States the knowledge sought in Italy with that intent, and there can be little question, I think, that his early death postponed for some years the advent of modern ornamental brick and terra-cotta architecture in the United States.

His success as a writer on currency was fully recognized in Europe, and is a part of the recorded history of the Social Science movement. It is mentioned here only in evidence of his versatility and of his conceded ability in whatever line of intellectual activity he chose to labor. He was certainly one of the pioneers among Americans in his European researches as a "State Commissioner of Industrial Art Education."

This use of brick in ornamental architecture, now so universal, began to become somewhat general a short time before the opening of the Centennial, but received a great impulse from that exhibition, especially in the development of the uses of terra-cotta.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

KIOSK IN THE JARDIN MARENGO, AND BOULEVARD IN FRONT OF THE SQUARE, ALGIERS, ALGERIA.

[Gelatine print issued only with the Imperial and Gelatine editions.]

WE promised some weeks ago to publish a view which should show that some species of palm-trees did possess "almost every quality of grace and architectural suggestiveness," and in fulfilment print this view. The kiosk, in the view above, is built of light sandstone and bright-colored tiles, surrounded in order to protect it from tourists who wish to carve their names in the soft stone, by a picket fence evidently designed by a New-England carpenter. The negatives from which both views are obtained were made by Mr. A. H. Dodd, an architect of Boston.

STATUES OF JOHN HARVARD, AT CAMBRIDGE, MASS., DANIEL C. FRENCH, SCULPTOR, AND OF DAUMET, THE MATHEMATICIAN, AT TOULOUSE, FALGUIERE, SCULPTOR.

FOR description see article on "Sitting Statues" elsewhere in this issue.

THE CENTRAL RAILROAD STATION, PROVIDENCE, R. I. MR. THOMAS A. TEFFT, ARCHITECT.

SEE article elsewhere in this issue.

HOUSES FOR W. MANSON, ESQ., CHICAGO, ILL. ADDISON & FIEDLER, ARCHITECTS, CHICAGO, ILL.

FLAT BUILDING ON SCHILLER ST., CHICAGO, ILL. OWNER AND ARCHITECT, MR. JOHN ADDISON, CHICAGO, ILL.

CENTRAL CONGREGATIONAL CHURCH, WORCESTER, MASS. MR. S. C. EARLE, ARCHITECT, WORCESTER, MASS.

STABLE AND COACHMAN'S COTTAGE FOR T. E. PROCTOR, BEVERLY, MASS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

THE remains of Montaigne have been removed to the vault of the new University buildings at Bordeaux. Several speeches were made, and M. de Brons, a descendant of Montaigne, thanked the Municipal Council, who defrayed the cost of the monument.

[1] We agree with the writer that it is dangerous for any one to assert for himself or another a priority in the use of a certain material, or the pursuance of a certain course. It is our belief that the use of ornamental brickwork is almost coeval with the use of brick in this country. Plain as are the older dormitories at Cambridge, they acquire a certain air of refinement for the use of *moulded* brick.—EDS.

STROLLS ABOUT MEXICO.[1] — XII.

A TWO DAYS' DRIVE IN SONORA.



Aqueduct at La Labor, Sonora.

I HAD spent several winter weeks in the Mexican State of Sonora, and, very reluctantly, was about to set face towards the North, with its snows and icy winds. It was at the capital of the State, Hermosillo — a place of beauty, as its name signifies, embowered in orange groves, with the clear Sonora river embroidering with its silver thread a broad strip of green meadows — that a Saxon friend of long residence said: "You will have missed one of the most important features of this region unless you see something of the great farms occupying one of the river-valleys."

Therefore it came to pass that we arranged a trip of about thirty miles up the valley of the Rio San Miguel, which joins the Sonora shortly above the city. We started in the middle of the afternoon. Our conveyance was a light and handsome six-seated carriage of American manufacture, drawn by four lively ponies. This was not exactly the kind of vehicle we should have had, according to preconceived notions of Mexican travel, but nevertheless it was a very popular one in that part of the country.

The minor rainy season, which, in Sonora, comes in January, had set in. It may, perhaps, be called an outer edge of the California rains which come in the winter instead of the summer, as in Mexico. There had been heavy showers the night before, and the roads were agreeably free from dust. Just at the edge of the town I remarked a pretty estate with thrifty orange-groves and flourishing expanses of sugar-cane. "There is a good story connected with that place," remarked my friend. "A rich Frenchman owned a great farm hereabouts. When Napoleon made Maximilian emperor of Mexico, so great was the rage against the French that all of that nationality had to leave before the invaders occupied Sonora. The stay of the French troops in this part of the country was brief; they were soon driven away, and the French residents did not dare return for some years after the war ended. Our rich Frenchman had an employé, a Mexican, to whom, on going, he gave a deed of all his property which he could not take with him. Money being all in silver, a large quantity could not be transported; therefore, the Frenchman left behind the greater part of his fortune. The Mexican administered his trust carefully, improved the cultivation of the land, and extended the tillage of certain crops which were in demand. Handsome profits were made each year, and were carefully laid by. The Frenchman returned in eleven years. He sought his old servant with fear in his heart, for he had lawfully given him everything for his own; it was the only way he could save his property from confiscation, and he had no claim upon it. The Mexican welcomed him with joy in his face, took him over the place and showed him the fine fields of corn and beans and sugar-cane, and the granaries full of wheat; he then exhibited the carefully-kept accounts and the large balance on the profit side; he counted out to him sixty thousand silver dollars and more which had been made, and then handed over the deeds of the property just as he had received them. The master was overjoyed, and in token of his gratitude he gave this handsome farm to the good and faithful servant."

We drove on and came to a little village just as the children were tumbling out of a rude adobe school-house with the tumultuousness common to school-children the world over. They looked as ragged and happy as the little beggars in Murillo's pictures, and in their scant raiment they were met at their home-thresholds by brown little brothers and sisters in no raiment at all.

The road, soft and sandy on the river-bottom, rough and stony on the slopes, and smooth as a macadamized way on the *mesas*, or uplands, wound on through the orchard-like chaparral that covered the country. At about dusk we came to extensive corn-fields where great herds were feeding on the stubble of the maize. Crossing the fields we met a man on horseback who advised us to stop at El Alamito, the rancho to which these corn-lands belonged, saying that we should be sure of a friendly reception there. We dashed down a steep, gravelly slope, crossed a swift stream of clear water, and passing a group of outlying buildings, drew up before a long house-front. A quiet-looking man met us at the door and spoke with my friend, nothing in his impassive face indicating the nature of what he said.

"He is telling him," said Canada, my friend's younger brother, who had accompanied us, "how he has no accommodations for us, and that we must drive on. A pretty prospect — eighteen miles further in the dark!" Canada was recently from the North, was almost as new to the country as I was, and was inclined to cynicism.

"He is saying," interposed his brother, "that we are heartily welcome; the best which the house contains is ours, and he is sorry that it is no better. He can give us a supper of tortillas, roast meat and frijoles, but alas, he has no beds, and we shall have to sleep as best we may."

[1] Continued from page 124, No. 533.

We thanked our host and followed him inside. He was the *administrador*, or superintendent of the place, and as there was litigation over the ownership of El Alamito, it was barely kept from going to rack and ruin. The house was built on a large scale, and had been a fine one in its day. But the day was a good many years back. We were shown into a long, high and bare room opening from the large and barren court-yard; it was scantily furnished with a few benches, chairs, and a long table. There were two young *señoritas* in the room, one a daughter and the other a niece of our host; the latter had the beauty of regular features, a clear olive skin, large black eyes and regular teeth. With the large, good-natured hostess, they bustled around in the adjacent kitchen, making their preparations for the evening meal.

The clerk of the estate came in. We remembered meeting him going into Hermosillo on horseback just as we were leaving the city; he had transacted considerable business, written several letters, and almost overtaken us on his fleet-footed pony. He was a large-eyed, intelligent-faced young fellow. He flirted with the girls as he sat near them at the table, and rolled cigarettes; he looked up into their faces with languishing eyes, and told about the kind of wife he wanted — one who was domestic, would care well for the house and children, and not be thinking of fine clothes all the time. At this the young ladies affected indignation and said that they did not mean to be slaves to men; it was a shame that a woman was expected to spend her life in perpetual toil!

At supper the table was neatly spread with a clean white cloth. The baked beef, cut up in strips after the manner of that part of the country, looked like pieces of roasted rope, but it was palatable, though pretty tough. When great flapping tortillas were placed by each plate Canada took them for napkins and was about to tuck his into his vest, when, fortunately, just in the nick of time, he observed the *señorita* opposite bear hers to her mouth and bite off a piece.

After the meal about a bushel of loose tobacco was brought and emptied on to the table. The *señora* began to rub it through a coarse sieve, and the *señoritas* rolled it into cigarettes. "That tobacco cost about ten cents a bushel," remarked my friend; "it is raised in considerable quantities around a little place up the river, called Sonora."

We sat and smoked the cigarettes and found the tobacco of a fair quality. We discussed with our host and the clerk the aspects of farming in Sonora, and the future of the State. It was agreed that quieter times were in prospect. The *administrador* thought that the railway, by bringing life and activity into the land, would prevent serious disturbances hereafter. The so-called revolutions had really not been such, for they were usually caused by feuds between leading families, and the masses had had nothing to do with their origin. The present generation of young men belonging to these great families would find plenty of business to occupy them and so would consume their energies formerly engaged in fighting.

When bed-time came we were left in possession of the room. We spread our blankets on the brick floor, lying down all three side by side, another blanket over us and the carriage seats for pillows.

"This is the first time I ever slept on a sidewalk," remarked Canada. We heard the rain pouring hard on the roof all night. When daylight came we did not know it until we heard the family stirring outside, for the doors and shutters of the room were tightly closed.

Stepping out into the open air, and looking about us in the early light, we saw that the place was much dilapidated from long neglect. The buildings were in a tumble-down condition, and some of them bore marks of Apache attacks, although these savages had not appeared in the neighborhood for years. A large flour-mill adjoined the house, and a steam-threshing machine stood in a shed. This, we were told, was in charge of a Yaqui Indian, who, after only a few days' experience with an engine in Hermosillo, learned thoroughly how to run and repair it, although he had never before seen one. I heard several other instances attesting the marvelously quick mechanical perception possessed by these Indians.

El Alamito was not irrigated from the San Miguel, which consisted of only a gravelly bed thereabouts, all the water being diverted farther up. A living spring, discovered by digging into a hill-side about two leagues away, supplied the water for the place. The *acequia*, or ditch, from this spring, resembled a natural brook: we could hear its grumbling as it was conducted past the house underground, appearing at the mill close by, where it leaped down a bluff in a clear cascade, falling into a large, well-like pit, upon whose bricked sides were patches of moss fringed with lace-work of delicate ferns. This stream was large enough to irrigate about two thousand acres.

The rain-clouds of the night were breaking up, and the air was still damp and chilly. It might naturally be supposed that the intense heat prevailing in Sonora during the greater part of the year would make the people very sensitive to cold, but they really did not appear to feel it in anything like the degree to which it affected us Northerners. Everybody was lightly clad; it seemed as if the exposure of their bodies to the heat of summer also made them insensible, to a considerable extent, of cold. The pretty son of the *administrador*, a brown, half-naked and dirty little fellow, ran barefoot about the court over the cold, damp pavement and wet ground, already educating himself for the career of a ranchero by swinging a raw-hide lariat and lassoing calves, dogs, pigs and poultry indiscriminately, the creatures scattering in terror before him, but rarely escaping his accurate aim.

After breakfast we started, our host energetically rejecting the proffered payment for our entertainment. The sun warmed up the air until it became like a mild May morning. The soft turquoise sky was filled with flocks of low-floating clouds that fleckered the mountain side with patches of shade and sunshine. Mexican scenery having hitherto been characterized for me by a clear-cut frankness of feature, this delicate atmospheric mysteriousness had an unfamiliar loveliness.

Our road plunged into the mesquite growths again, many varieties of cactus keeping company with the trees, notably the two pitahayas, called respectively the *dulce* and the *agria*, the sweet and the acid, from their fruits, and the *cholla*, which looked like a mass of writhing serpents bristling with needles. Nearly everything in the shape of vegetation, except the grass, appeared armed with thorns. Now and then we met a flock of goats by the roadside, some of them standing on their hind legs and browsing from the mesquite branches, to the great risk of their noses from the thorns, it seemed to me.

Rabbits often scampered over the ground, both the large and long-legged jackass and the little cotton-tail varieties. There is a story that the latter feed on the fruit of the *cholla*, knocking it off the plant with a stick held in their fore-paws, then rolling it over the ground until the prickles are rubbed away; I will not vouch for the truth of this yarn. There were no serpents to be seen anywhere, for they were hibernating, although it was warm enough to make a United States snake very lively.

A large and striking-looking bird ran across the way before us. "That is the Road-runner, the Correo del Camino, the deadly foe of the rattlesnake," said my friend: "when it comes across a snake it builds around him, as he lies on the ground, a corral of pieces of *cholla*. The prisoner could not possibly escape across the thousands of bristling needles surrounding him. As he lies coiled, the road-runner hovers in the air close above, and so confuses him with his fluttering wings that he strikes blindly about until pierced through and through by cactus-needles, cutting himself nearly to pieces and becoming so exhausted that at last he falls an easy prey to the bird, which perches on his back and pecks out his eyes."

The snake-charmers of the Moqui pueblos in Arizona, Captain John G. Bourke tells us in his book, hold armfuls of squirming rattlesnakes, and prevent their biting by incessantly fluttering before them plumes of eagle-feathers very much as those birds are said to flutter their wings. It is probable that the charm lies in the diversion of the snake's attention, and perhaps the Indians learned their secret from these road-runners. Snakes have, according to universal tradition, devoted themselves so extensively to the charming of innocent birds, that I was glad to know that the tables could be turned, and that there was a bird plucky and cunning enough to occupy himself with the charming of wicked snakes.

We passed, here and there, large wooden crosses and groups of crosses, raised above heaps of stone beside the road. These marked the graves of people who had been killed by Apaches. One stone-pile was very large, and, hard by, several crosses were nailed to the trees. These crosses had an uncanny look. They were gray and weather-beaten, and their long, thin arms stretched out warningly, like those of ghostly skeletons. This great stone-heap was the common grave of about twenty people who had been massacred there.

The Apaches are well called "the Sonora scourge," and the stories of their atrocities, too horrible to repeat, are heard everywhere. Each place has its own sad tale. Poor Sonora! What with her dissensions, her foreign invasions, and the terrible Apaches — more to be dreaded than the fiercest of wild beasts that ever terrified man — it is no wonder that her population has diminished and her most fertile valleys lie fallow.

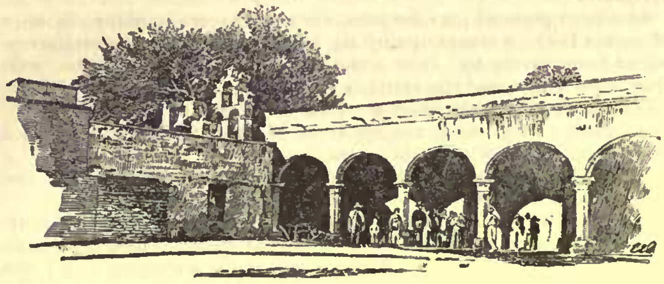
I shuddered as we passed these gaunt wayside crosses; they made me think of gallows, gibbets, and other unpleasant things. The Apaches were accounted far off then, and it was years since the crosses had been raised; but many a merry group, driving carelessly along just as we were then — the landscape as quiet and peaceful as Eden before the fall — had been startled by a yell that froze their blood as it broke the silence, and nobody had lived to tell how the dark forms had sprung upon them out from the green covert spread over the plains, the best of shelters for a savage foe. Men whose companionship I had enjoyed only a few months before — full of sturdy life, courage, and hope of fortune after which they were toiling in the wilderness for the sake of dear ones at home — now, after the agonies of nameless tortures, lay stretched in endless sleep on the plains.

These thoughts were repelled almost as soon as they occurred, and the light of our morning mood scattered them with the thin clouds. But, indeed, it was only a few weeks thereafter that the Apaches did appear in that part of the country, and the trail of blood and desolation which they left had its course not many miles from the road we travelled.

As our way curved about, we now and then caught glimpses of the San Miguel valley, whose level floor, covered with young wheat, looked like a verdant lake stretching away between the uplands. Below us lay groves of dark, gold-spangled orange-trees, and the expanding wheat-fields were populous with sylvan groups — cottonwood, ash and guamuchile, in clusters and clumps, or standing in single mounds of leafage, like the elms in a New England meadow.

These fields belonged to the great estate of La Labor, our destination, and there soon appeared in the distance a large and palatial-looking white house standing in the midst of level, cultivated lands at the end of a broad avenue of noble alamos or cottonwoods, in

whose ranks there were many gaps where old trees had fallen or had been cut down. Thereby, in our eyes, the place was given at the outset something of the picturesqueness which comes from venerable age touched slightly with decay. The avenue was crossed by three *acequias*, into whose waters our carriage plunged nearly up to the hubs as we crossed. The foliage of the cottonwoods above us and



Court-Yard of the Manor House, at La Labor, Sonora.

before us had a magical aspect. It was like billows of gold and emerald intermingled. The depths of the mass were living green, and the leaves were turned to gold on the surface, like sun-kissed foam on waves of the sea. All through the winter, so called, the change goes on; the young leaves growing old and the old leaves falling in golden showers. The branches are never bared. Winter, in fact, drops out of the season's round in this land where autumn and spring join hands. Out in the fields a cluster of cottonwoods stood before a background of guamuchiles, and the golden green of the former against the perennially dark and rich verdure of the latter brought out the complexion of each tree in glorious contrast, like that of blonde and brunette standing side by side.

We were welcomed by the two joint proprietors of La Labor, the one a German, and the other a Mexican whose florid complexion and reddish beard made him look more Teutonic than his partner, — an evidence of how the blood of the Visigoths runs down the ages through Old into New Spain. Both gentlemen spoke English perfectly. They would not listen to our talk of going back that afternoon, as we had intended, insisting on our stopping over night and really seeing something of the place.

The house was an exceptionally good type of the best Mexican country manors. It was one story high, but built of brick covered with cement. There were fifteen large rooms. The front had a handsome arcade, giving a broad, tile-paved veranda. A similar arcade ran along two sides of a large court in the rear. A chapel adjoined the house and formed a third side to the court, behind which was a garden filled with flowers and fruit-trees, including figs, guavas, oranges and lemons, besides a variety of vegetables. In the chapel were the tombs of the ancestors of the Mexican proprietor. On all the large estates in Mexico are peasant villages like those which in Europe cluster around old castles, and once were the homes of the vassals of feudal families. There are always chapels for the benefit of the laborers and the household retainers. Here at La Labor a mass was said once in two months.

The court was used as a corral, no stable being needed in that climate. In the centre there was spread a mass of maize on the ear, looking like a large treasure of ruddy gold. The horses stepped up and helped themselves freely whenever they felt an inclination, and, having their food constantly before them, they were not tempted to overeat themselves.

Outside, near the chapel, there was a blacksmith and wagon shop, with Yaqui Indians as mechanics, and beyond this stood a large and well-equipped flour-mill, run by water-power from a massive brick aqueduct.

We had an excellent dinner, a feature of which were toasted tortillas, which, being very thin, were by toasting made crisp and delicate. For dessert there was a nice marmalade of peaches and guavas mixed, a wedding of northern and tropical fruits raised on the place, excellent in its results.

After dinner we mounted horses and rode over the estate, crossing one wide wheat-field nearly a mile long, the dainty young blades shooting up through the dark, mellow soil, in which not a stone was to be seen. There were about two thousand acres of cultivated land, and the average yield of wheat was something like sixty-two bushels to the acre. The entire estate was fifteen miles long and three wide.

We rode over wide fields where planting and preparations for planting were going on, the ground being ploughed up after the summer crops of maize and beans, and irrigated preparatory to the sowing of wheat, the regular winter crop. Although irrigation requires considerable care and labor, the returns are great enough to compensate for the extra trouble, to say nothing of the absolute certainty of harvest assured. The great advantage of agriculture in a country like Sonora is that two crops a year are grown on the same ground, thus, in comparison with tillage in the north, practically doubling the area by crowding two seasons into one.

Yaqui Indians were at work irrigating in the fields, and good-looking laborers they were, with tall, shapely forms, bronze-like limbs, and faces contrasting with their light cotton garments, and their hair cut square around their heads like that of Dutch peasants. They guided the water over the fields with their hoes, until it was diffused over the soil in hundreds of little veins, looking, under the evening sun, like tangled skeins of gleaming silver threads spread on the ground. The fields were as level as the waters of a lake, and where lowland and upland met the appearance was that of an irregular line of shore with a border of trees and shrubbery.

Three avenues of cottonwoods came together at the mansion, and we kept on to the northward through the grandest of all, a lofty tunnel of shade under magnificent tall trees. One little knows what glory the cottonwood, despised on our western plains, is capable of attaining until he has seen it in Mexico. The succession of towering trunks framed the landscape at our sides into a series of pictures as we rode. The mountain peaks embracing the plain glowed in the red sunset light, and at the end of the valley stood the remarkable mountain, El Picacho de Rayon, with a lone needle, as slender as a finger, rising among the neighboring summits like a cathedral spire above city houses. It is a landmark for hundreds of miles around, and is seen from as far northward as the national boundary line between Sonora and Arizona.

We rode away from the avenue through narrow side lanes, meandering among tall cane-brakes and hedged with the great prickly-pear cactus, with disk-formed arms that assumed wierdly, fantastic



Unfinished Chapel of San Antonio, Hermosillo, Sonora.

shapes in the gathering twilight, like huge sea-monsters crawling over the land. The frail huts of the Yaqui farm-laborers skirted these lanes, each with its little garden patch; here their dwellers lived in humble content, though paid but a few dollars a month.

That night we slept on comfortable cots with the cleanest of linen. In the morning, after a nice breakfast of delicious coffee and rolls made from the fine white flour produced on the place, we started on our way back. The brisk air, though sparkling with sunshine, seemed to have a touch of snow in it, and we were afterwards told by those who arrived on the train the next morning, that the ground near the boundary to the northward was spread with a white mantle.

When I returned North it was by special train, from which I could see by daylight that part of the line usually traversed at night. The land for the most part resembled the upland which we had travelled over in our drive, covered by an open growth of mesquite brush, with now and then wide grassy plains.

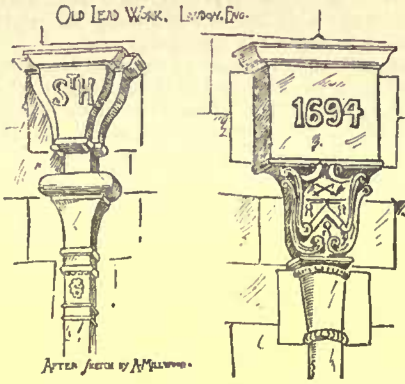
It would hardly have been conjectured that a fair and fertile valley like that of the San Miguel lay only a few miles to the eastward of the track. In the Magdalena valley the railway passes through a beautiful country with finished cultivation. Magdalena has a handsome old church, and has orange-trees and date-palms which cease beyond the neighboring town of San Ignacio, on account of the increasing altitude. At the station of Imuris, however, the climate was not so severe as to prevent an Indian boy from appearing beside the train in a winter costume that consisted of a string around his neck. When a camera was aimed at him, with the intent of securing an instantaneous picture, he fled as though it were a Gatling gun. A more complex garb was that of a Mexican on the station platform, whose trousers were an elaborate work of art. Each leg was decorated in front with a handsome piece of panther-skin set in a border of stamped leather and much silver embroidery.

As the railway continued northward the valley contracted. There was a surprising abundance of running water for a country generally considered arid. The altitude was that of the *encinal*, the live-oak belt, and the noble trees covered the plains and hillsides in groups and groves, their deep-green glistening richly in the afternoon sun. The charming glades and vistas, the lively grace of the ever-changing pastoral landscape, gave the country the aspect of a finished park in Europe, rather than that of a wild land where the Apache has long cast his blighting shadow.

The scenery grew wilder as the Arizona boundary was approached, and the passage of the narrow Cañon de la Casita offered a succession of ruggedly picturesque views. Shortly thereafter we crossed the line at Nogales, and were once more on United States soil, climbing into colder weather. SYLVESTER BAXTER.

THE ALBANY CAPITOL.—The information is furnished that the State Capitol at Albany has already cost in round numbers $17,500,000. Republics may be ungrateful, but they are not what might be called phenomenally penurious.

THE PANAMA CANAL.



At the regular meeting of the Engineers' Club of Phila. on May 15, Mr. E. S. Hutchinson read a paper giving a *résumé* of the Report of the Hon. John Bigelow on the Panama Canal made to the New York Chamber of Commerce.

After stating that the Chambers of Commerce of some European cities as well as that of New York were invited by Mr. De Lesseps to send delegates to assist at the inspection of the Canal in February last, he briefly described the work as follows: —

The project contemplates the construction of an open ship-canal, without locks, from Colon, on the Atlantic side of the Isthmus, up the valley of the Rio Chagres, through the Cordilleras at Culebra, and down the valley of the Rio Grande to the bay near Panama, on the Pacific. Beginning at sea-level at Colon, the canal reaches Matachin, 27 miles, with cuttings varying from 20 to 168 feet; from Matachin to Culebra, 7 miles, the hills are from 100 to 240 feet, while at the latter point the crossing of the Cordilleras, the maximum cut is 320 feet; along the 8 miles to sea-level the decline is rapid. The 4 miles remaining will be dredged 325 feet wide in Panama Bay to Perico Island. The plan necessarily includes the erection of a breakwater and other extensive harbor improvements at Colon, with a breakwater and jetties, and a tidal-basin at La Boca. Depth of water to be maintained 27 to 29 feet. In the low lands the widths will be 164 and 72 feet, top and bottom respectively; and in the Cordilleras they will be 102 and 78 feet.

The original plan "Mr. Hutchinson believes" contemplated the construction of "sidings" or passing places every 6 miles; but the Report mentions only one, 3 miles long, at Tavernilla, 19 miles from Colon.

The most serious obstacles to be overcome are treated of under four heads:

First. — The control of the River Chagres.

Second. — The cut through the Cordilleras at Culebra.

Third. — Keeping the channel open from mouth of the canal at La Boca to near Perrico Island.

Fourth. — Securing the labor required at practicable rates.

The Report states that the Chagres, which, with its tributaries, has a normal flow of 450 to 500 cubic feet per second, has recently been known to rise 40 to 50 feet, and discharge 2550 cubic yards per second; and in 1857, Col. Totten gauged it at 2093 cubic yards per second; and that the improved channel of the Chagres will carry off 520 cubic yards per second, so that, at a time of maximum flood, 1573 cubic yards per second will have to be provided for. He mentioned the two plans that have been proposed to get rid of the dangerous surplus; one, the construction of lateral channels, and the other the building of a catch-water basin, large enough to hold a flood or two of the Chagres. Mr. Hutchinson said that within a few days he had been officially advised that both plans are still under consideration by the Technical Commission, though Mr. Bigelow is of the opinion that the "dam" project is most in favor.

He condensed from the Report a description of the "dam": three quarter of a mile long, 140 feet high, 1300 feet wide at base, with exterior slope of 4 to 1. Waste-weir, a 20 feet diameter tunnel, with in-dam orifice 80 to 100 feet *above* bottom of dam. Quantity of material, 9 millions cubic yards, with a reservoir capacity of 4 billions cubic yards. He pointed out the important omission from the Report of the results of the examinations for depth of foundation for the dam, and also of estimate of cost of construction.

He quoted from the Report that the maximum cut at Culebra was 320 feet, and that quantity of material to be removed at this point, and within 1½ miles, was 26 million cubic yards. The Report goes on to state that the Anglo-Dutch Company, which had contracted to remove 915,000 cubic yards per month, has never excavated 131,000 cubic yards per month, that only 1¼ millions cubic yards had been removed up to January 1st, 1886, and that this contract was so modified that from 800,000 to 432,000 cubic yards per month were to be taken out during the next three years, ensuring the completion of the work by July 1st, 1889.

Mr. Hutchinson concluded that from the meagre figures given this would be impossible, and that, if there were no increase in the rate, fifteen years will be required, even if no serious or unforseen delays occur. He noted the important fact that the Company was to furnish machines and men, and that, having failed in its part of the contract, the contractors were released from all obligations.

He was of opinion that the Report did not show that careful surveys had been made of the Panama terminus, as important questions mentioned elsewhere were not touched upon. "Plans," it states, "are in contemplation for a dam across the Grande, for a dyke 4 miles long, from Gama Point to Naos." No mention is made of the tidal-basin ¾ mile square, which is deemed indispensable, and has recently been estimated will cost 30 million dollars. It went on to state that very little work has been done at this terminus, none within the shore line, and that very extensive repair and construction shops had been erected near the Mangrove Swamps, and that the pestilential exhalations were particularly fatal to skilled labor.

He noted that the Report treated the labor question quite fully. It points out that the native supply was very limited and uncertain, and that agents of the Company were constantly employed in all of the available markets gathering recruits; that the percentage of desertions was heavy; that of the 12,000 men on the rolls, the number is thought to be considerably exaggerated; that unskilled labor, which at the beginning had been 90 cents, was now $1.75 per day; that skilled black-labor ranged from $2.00 to $2.75 per day, while white mechanics received $5.00 gold.

He drew attention to that portion of the Report which states that the American Contracting and Dredging Co. had a contract for excavating 39¼ millions cubic yards of dredgable material from the port of Colon, from the Main Canal, and from the Auxiliary Canals, for the improvement of the Rio Chagres, and extending from Colon to Matachin, about 27½ miles. There will be 18⅝ miles of auxiliary canal. Work was begun early in 1884 and has been kept up steadily, there being at present 7 dredges at work. Up to January 31st, of the present year, this Company had excavated about 7 million cubic yards, the amount for January being 952 cubic yards. Mr. Bigelow appears to have no doubt but that this Company will have its work completed by the stipulated time, December 1, 1887.

Mr. Hutchinson also observed that a list is given of *six* contractors who were to have had contracts amounting to 125 million dollars, only one of which, the American Contracting and Dredging Co., is mentioned as having done any work, unless it be that the Anglo-Dutch Co., which is reported as at work on the Culebra cut, is identical with the "Societé des Travaux Publiques et Construction Companie," which he is unable to determine.

He considered it desirable to know whether or not any of these companies have thrown up their contracts? What companies are still at work? Where on the line they are located? What amount of work has been done by each?

He quoted from the Report that on January 31, there were 21 dredges and 82 excavators on the work, "with the auxiliary boats, trains and machinery," and added that for further details we must seek elsewhere.

He abstracted the quantities as follows: The total excavation necessary to complete the work was given by the engineers at 157 million cubic yards. To February 1, 1886, there have been done 18½ millions — 11¾ per cent — leaving 138½ millions yet to be done — 88¼ per cent.

Total excavation, January 1,	1886,	17 million cubic yards.			
" "	September 1, 1884,	10	"	"	"
" "	16 months,	7	"	"	"

Average per month for 16 months, 425 cubic yards.

The work for January, 1886, was 1,400,000 cubic yards.

He remarked that at the latter rate about eight years from February 1, of this year, would be required to complete the work, were there no other problems than that of excavation to be considered, and that the unknown quantities in the problem were too many for ordinary methods of solution.

Mr. Hutchinson pointed out that, as regards the matter of expenditures, Mr. Bigelow adds nothing to M. De Lesseps's Report of July, 1885; nor is the date of closing of the financial year given. Adopting the figures of this report, we have total amount realized to that date: 94¼ million dollars; expenditures, 73½ millions; balance 20¾ million dollars. Of the total expense only 23 million dollars—31 per cent — were for installing machinery, clearing line and excavation; the remainder were for expenses of organization, supplies and plant. Since that date the company has received 25 million dollars, but what the expenses have been approximately for the past year, more or less, Mr. Bigelow does not inform us.

The paper concluded by remarking that the map accompanying the Chamber of Commerce Report was on the small scale of about 46 miles to the foot, and that it appeared to be a copy of one made to show the condition of the work, June 1, 1884, two years ago.

The final conclusion seemed to be that in the interest of engineering it was to be greatly regretted that the inspection and report had not been made by a thoroughly equipped engineer.

The Oldest House in Philadelphia.—All this naturally suggests a query as to which is the oldest dwelling-house in Philadelphia. Some will contend that William Penn's cottage, known as the Letitia House, is entitled to that distinction. I do not think so. True, it was built in 1682, and there is no building now standing in Philadelphia that was erected prior to that time. But then I look upon the Letitia House since it was torn down and re-erected in Fairmount Park as nothing more than a relic placed in a museum. It does not stand on its original foundations, bidding defiance to time. The structure that appears to be entitled to the distinguishing name of the "oldest building standing in Philadelphia" appears to be the Shoemaker House, which is on the north side of the lane of that name and east of the Philadelphia, Germantown and Chestnut Hill railroad. Nowadays it is known as the "Rock House." Watson, in his "Annals of Philadelphia," speaks of it as "standing in Mehl's meadow," and said that it was built in 1686.—*Philadelphia News.*

SOCIETIES

AMERICAN INSTITUTE OF ARCHITECTS.

AT an adjournment (May 21, 1886,) of the first meeting (May 19, 1886,) of the Board of Trustees of the American Institute of Architects, after the death of Mr. H. H. Richardson, F. A. I. A., the following resolutions were unanimously adopted: —

Resolved, That the Board of Trustees A. I. A. have learned with deep regret of the death of Henry Hobson Richardson, a Fellow of the Institute since 1866, and at one time a member of this Board. A man preëminent on the artistic side of his profession, and thoroughly educated in the best French school, his advance from the time he began to practise in this community has been a steady one, and ever increasing in interest, alike to onlookers in his own country and to those across the water, who knew the promise of his youth. Upheld by his devotion to his profession, and his delight in its results, he worked on zealously and bravely to the very end, in spite of the constant inroads of a necessarily fatal disease; while his strong personality made it so easy for him to communicate to others his own enthusiasm for his art, that among those who shared the advantages of his *atelier* there will doubtless be amply shown the fruit of their association, though his loss must long be felt by them, and by many others whom his example has inspired.

His good and long-continued training, joined to his abundant genius, enabled him to give quite a novel stamp to much of his work, particularly in the case of his public buildings, and the ancient, round-arched style of southern France — here and there modified by a Renaissance feeling, and heightened in detail by rich and delicate decoration, evidently inspired by Byzantine remains — has assumed a new importance and increased value to architects, as illustrated by his productions, all of which — after his first experiments in practice, and with constantly-increasing uniformity — show the grasp and vigor of his strong nature.

Resolved, That we hereby tender our cordial sympathy to those who miss him most in the domestic circle, and that a copy of these minutes be sent to his bereaved family.

(Correct) GEO. C. MASON, JR., Secretary A. I. A.
Per A. J. B., Secretary *pro tem.*

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

WHITE-BIRCH BARK AS A ROOFING MATERIAL.

BOSTON, June 5, 1886.

BOSTON MANUFACTURERS' MUTUAL FIRE INSURANCE COMPANY.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I beg to state the following somewhat curious incident:

A very old house in Newburyport, belonging to one of the officers of this Company, built in 1672, is now being repaired. The joints of the roof-boards were found to be covered with white birch-bark, of which I enclose an example. You will observe that it is perfectly sound, the outside being scarcely discolored.

The house is 44′ x 32′ — the boards running from ridge-pole to plate, on the slant of the roof, averaging eighteen inches wide. These boards are also sound on the North side, but somewhat impaired on the South side.

The roof has, of course, been shingled several times.

It seems probable that the birch-bark was made use of to cover the cracks between the boards, before any shingles were put on.

Very truly yours, E. A.

A QUESTION OF COMMISSION.

KANSAS CITY, MO., May 27, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — We should like to profit by your large experience, and, therefore, desire an opinion in the following case: A School Board of a prominent city invited a number of architects to present to them sketches of floor plans for a twelve-room school-house. Six or eight plans were received, and one to cost $20,000 was selected and adopted, the architect chosen, and fees on the cost of the building agreed upon, and he was ordered to proceed and make all necessary plans, elevations, sections, details, and specifications. Before the drawings were commenced they made a change in the floor-plan, making the area larger, and gave instructions to the architect to keep as near $20,000 as he could, whereupon the drawings were commenced. Very soon the architect received orders in writing to place range stonework about six feet high around the building, which was about four hundred and twenty-five feet around. A few days later another order was received to put cut-stone steps to the front entrances. Later, as the drawings progressed, an order was received to put gas and water in the building, and embody the same in the plans; several other changes were ordered by them. The drawings were finally completed, with specifications, and sent forward. The receipt of same was acknowledged, with comments that the drawings were all satisfactory and very complete, but they desired the architect's estimate on building, which was immediately forwarded to the Board, which was $33,000. On receipt of same they immediately replied that the plans and drawings were rejected by the Board, on account of cost, and that the drawings were held subject to the orders of the architect. Under those circumstances can the Board be held for the amount of the drawings and travelling expenses, or must the architect lose what he has done? Truly yours,

A READER.

[ON the statement of the case here made we should say you would have a good and valid claim for whatever commission was agreed upon between you and your client, if that client had been a private individual. This presupposes that you have a written contract or agreement in compliance with which you began the work: for the subsequent changes and alterations you evidently have written instructions which will protect you in court, unless, as so often happens in cases where the client is a "Board," there is some informality in the way of lack of record or vote or signature of the proper authority. We have known cases where the absence of the Board's seal has been enough to cause the architect to lose his suit. Something, too, will depend on whether the plans, as originally accepted, could be executed for $20,000, and whether you can show that the changes and alterations really added $13,000 to the probable cost. We think it was extremely injudicious not to explain to the Board, with the greatest particularity, that the alterations they proposed would add sixty or seventy per cent to the cost of the building.— EDS. AMERICAN ARCHITECT.]

TRAVELLING EXPENSES.

NEW YORK, May 27, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — As it may be of general interest I would ask you to say what the most approved practice of the profession may be with regard to charges for travelling expenses when the supervision of work in a distant place requires the architect to remain for a week or more at frequent intervals. Is it proper to charge hotel bills or merely the bare railway fares? P.

["TRAVELLING expenses" may properly include all those reasonable expenses which an architect incurs in his client's service to which he would not have been subjected if he had remained at home. In some cases it is proper to charge the client with all such expenses in full, and in others, for instance, where the architect is in bachelor's lodgings and his landlord makes allowance for his absence, he might properly credit his client with this allowance as an offset to the hotel charges incurred. On the other hand the married architect whose home expenses are not affected by his temporary absence may charge his reasonable hotel bills in full. But in the case of prolonged absences, such as are contemplated by our correspondent, the proper way, we think, is to have an understanding with the client from the start by which it shall be understood that travelling expenses shall mean a certain fixed sum *per diem*, a sum in excess of the probable bare expenses incurred, for it is patent that the architect's other interests may suffer in his absence.— EDS. AMERICAN ARCHITECT.]

ORIENTAL PHOTOGRAPHS.

CINCINNATI, May 28, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Would you kindly suggest some way by which I could procure architectural photographs from cities in India, China, Japan and other Eastern countries?

An early answer will greatly oblige Yours truly, A. M. C.

[THE Soule Photograph Company, Washington St., Boston, publishes a very fair line of Eastern photographs, though none of large size.— EDS. AMERICAN ARCHITECT.]

PRINTED CONTRACT BLANKS.

ST. LOUIS, MO., May 28, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Can you inform me where I can procure a copy of a contract and bond (printed) between architect and owners?

By so doing you will greatly oblige a subscriber to your valuable paper. Yours respectfully, JOHN A. FOLKSON.

[IT is not unlikely that you could procure the documents at any law stationer's. At any rate you can get them from Palliser, Palliser & Company, of Bridgeport, Connecticut, or from W. T. Comstock, 6 Astor Place, New York.— EDS. AMERICAN ARCHITECT.]

WIND-MILLS FOR WATER-SUPPLY.

NEW YORK, June 5, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Your reply to Mr. Wolff's complaint in your issue of this date, although qualified, rather leaves us to answer for copying his article without credit. To correct any misapprehension in this regard I mail you a copy of our issue for January 15th, in which the article referred to appears, duly credited to both author and original publisher.

Will you kindly mention this in your journal to show Mr. Wolff, and the readers of his letter, that the only offender has been an ac-

cident of the kind which occasionally happens in even the best regulated editorial families.
Truly yours,
The Editor of *The Sanitary Plumber*.

[The reason for our wording with some ambiguity of the explanation here corrected, was that the article on windmills was published during the illness of the editor who, on his return to his desk, could not find the "copy" from which the article was set up, and consequently was obliged to invent an explanation which he regrets to find was not the right one.— Eds. American Architect.]

THE BUILDING STONES USED BY MR. RICHARDSON.

To the Editors of the American Architect: —

Dear Sirs, — Please inform me, through your journal, what colors of stone Mr. Richardson principally used, and oblige,
Yours truly, J. Grandon.

[Mr. Richardson's favorite materials were Longmeadow sandstone, which is somewhat darker than most of the red sandstones; Bay of Fundy granite, which is a warm drab with a tinge of pink; and Ohio sandstone. With the Longmeadow stone North River bluestone was often used in small quantities. These for the exteriors of his buildings. For inside work he used whatever stone, however precious, that best suited the place and occasion.—Eds. American Architect.]

NOTES AND CLIPPINGS

The Great Steel-Pipe Contract.— The Buffalo *Iron Review* says, in reference to a contract which has puzzled iron men: "Charles Kellogg, formerly president of the Kellogg Bridge Works, of this city, has obtained letters patent for the manufacture of tubing drawn from steel ingots, seamless, and has already closed a contract with a New York syndicate for the delivery of 50,000 tons of thirty-six, forty and forty-eight inch pipe. The pipe is to be used for water, sewer, and steam purposes in the City of New York and vicinity, and the syndicate reserves the right to duplicate the order at the same terms. The contract is the largest ever yet closed at one time for pipe, amounting to $4,000,000, and, as there seems to be little doubt of the feasibility of manufacturing by this process, the invention is one of the most important in modern times."

Strength of Riveted Joints in Steel Plates. — The experiments of Professor Kennedy, made by the Research Committee of the Institution of Mechanical Engineers, on riveted joints made in soft steel plate with steel rivets, are of value. In the first place, it was found that the metal between the rivet holes has a greater tensile resistance per square inch than the unperforated metal. This excess of tenacity amounted to more than 20 per cent in both $\frac{3}{8}$-inch and $\frac{3}{4}$-inch plates, when the pitch of the rivets was about 1.9 diameters. With a pitch of 2 diameters the $\frac{3}{8}$-inch plate gave an excess of 15 per cent at fracture; with a pitch of 3.6 diameters it gave an excess of 10 per cent; and with a pitch of 3.9 diameters, an excess tenacity of 6.6 per cent. Referring to shearing resistance, it may be taken as established that the resistance per square inch in double shear is as great as that in single shear, so that allowance need not be made for the two shearing planes not being equally stressed. In single-riveted joints it may be taken that about 22 tons per square inch is the shearing resistance of rivet steel, when the pressure on the rivets does not exceed 40 tons per square inch. In double-riveted joints with rivets of about $\frac{3}{4}$-inch diameter, most of the experiments gave about 24 tons per square inch as the shearing resistance, but the joints in another series went at 22 tons. These experiments have also shown that the size of the rivet heads and ends plays an important part in the strength of the joints. An increase of about one-third in the weight of the rivets in the heads and ends, was found to add about $8\frac{1}{2}$ per cent to the resistance of the joint, the rivets remaining unbroken at 22 tons per square inch, instead of shearing at a little over 20 tons. The gist of the results attained point to very simple rules for the proportioning of joints of maximum strength. Assuming that a bearing pressure of 43 tons per square inch may be allowed on the rivet, and that the excess tenacity of the plate is 10 per cent of its original strength, the values of the ratios of diameter of the hole to thickness of the plate are determined. These figures show that the diameter of the hole should be $2\frac{1}{3}$ times the thickness of the plate, and the pitch of rivets $2\frac{5}{8}$ times the diameter of holes. In mean, also, it makes the plate area 71 per cent of the rivet area.

Practically it may be said that we get a double-riveted butt joint of maximum strength by making the diameter of hole about 1.8 times the thickness of plate, and making the pitch 4.1 times the diameter of hole. In boilers where great strength of joint is required, the danger of corrosion of the plate part of the joint has to be guarded against. This part is more affected by time than the rivets, and therefore it is necessary to estimate the percentage by which the plates might be weakened by corrosion before the boiler would be unfit for use at its proper strain-pressure, and to add correspondingly to the plate area. — *Builder.*

TRADE SURVEYS

Real estate and building operations are considerably ahead of last year in eight of the large cities of the Union, according to the published figures. If the facts were obtainable it might be found that the same observation is applicable to eighteen and perhaps eighty cities, and to innumerable smaller towns and villages throughout the United States. In fact, careful inquiry shows that the smaller towns and villages have escaped the almost revolutionary attack of labor, and further that, in such small localities capital has been actively seeking a permanent abiding-place inpreference to employment in larger cities where taxes, agitations and trade-union control render returns more uncertain. The advantages of locating manufactories, large or small, in cities is not so apparent now as a few years ago. This tendency of manufacturing capital to escape from larger cities is shown in many ways. A half-dozen silk-mills have already been established in Eastern Pennsylvania and sites are being located for another half-dozen. Within a few years large iron and steel works have been established in or near small towns and villages. Makers of machinery are pursuing the same general policy. The small towns of New York, Pennsylvania, New Jersey, Ohio and two or three other Western States, have been chosen as the best location. As a consequence, there is relatively more building activity in these smaller towns than in the larger cities. Small houses are being put up and a great deal of work of this kind is projected. New England building operations show a moderate increase in building activity over last year. All her industries are prosperous. Labor agitations continue to threaten the maintenance of friendly relations, but permanent peace is in sight. The figures of New York City show that for the first five months building operations foot up in value $1,000,000 including 2,000 structures. More property changed hands in that city this year than last and at higher prices. This year's conveyances foot up 6,440 in number, and represent in value $123,000,000 against 5,114 conveyances up to same time last year and $83,000,000 in value. In Philadelphia the increase in permits is thirteen per cent; in Pittsburgh ten per cent; in Chicago fifteen per cent, and so on. These are valuable indications of existing and prospective activity. For a few weeks past, architects in all the larger cities have been complaining more or less of delay, but within two or three weeks business has considerably improved. Builders are now under orders to push work that has been delayed, but to what extent it is impossible to say. Another favorable indication within the past few days is the closing of a number of contracts for building material, including iron and steel work and lumber. The continued exportation of gold is an unfavorable feature, but is not at all injurious. Imports for the past year, ending April 30th, show an excess of some $33,000,000 over the previous year, while exports are $78,000,000 less. The strong underlying factor in our commercial system is that we have a large volume of cheap money which prefers employment at some price even if a low one. Abundant money at two to three per cent is a greater incentive to activity than a moderate volume of money at five to six per cent. The present general demand for real estate is legitimate and must improve rather than decline. Trade and industrial conditions are improving for other reasons than this. The industries are on a broader foundation to-day than twelve months ago. Trade prospects have been more or less injured by the shorter-hours movement, but manufacturers are able to discount it though by no means assured that this movement will not be revived under a better organization at some time in the near future. The confederation of employers for protective purposes is being vigorously prosecuted not only throughout the New England and Middle States, but in the farther West where the advantage of such federation is being recognized. Slower progress is being made in Western cities than in the East, but in a few months some of the larger industries there will be acting in concert. These federations will not lessen the number of strikes unless their managers show a disposition to use their organization to confer with the leaders of labor unions. The iron markets are dull. Scarcely any business will be done during the rest of this month. Probably the Amalgamated Association will not insist upon higher wages. Rail-makers are receiving small orders and plate-mills and bridge-iron mills are kept busy though in but very few instances are they crowded. The productive capacity is a little beyond the present demand and hence prices incline downward. The anthracite coal trade is spoken of as dull, but this is due to the action of the producers themselves who are restricting production and keeping prices up to a high figure by the combination. The bituminous strikes have decreased the output of soft coal for Eastern markets over 1,000,000 tons. The coal producers are using every effort to enlarge their markets, and are meeting with success. Scarcely any strikes exist and miners grievances have been largely removed. In the lumber trade prices continue very firm, particularly for white pine in Northwestern and Northeastern markets. Within two weeks shipments have increased rapidly and at this time large quantities are being forwarded West and East on which good prices are being realized. Large receipts of yellow pine are reported at New York and Philadelphia and on account of high freight-rates prices continue firm. The better grades of hardwoods are scarce in all markets, walnut particularly. It is the expressed opinion of lumber authorities in Eastern and Northwestern markets that the distribution of lumber for the next six months will prevent any weakness in price and keep the markets well sold up. The Western nailers, to the number of 1,100, have returned to the Amalgamated Association. The textile workers are preparing to form a national assembly for the regulation of wages just as the glass-workers and the miners and one or two other trades have done. In spite of this threatening attitude of organized labor, manufacturers continue to expand capacity, believing that the present dulness and difficulties are only temporary, and that a prosperous future awaits every branch of American industry. Commercial failures have fallen off this year as against last in the proportion of fifty-five to forty-seven, with a corresponding decline in liabilities. The smaller manufacturing industries throughout the country are pretty fully engaged. Very few are over-crowded. In manufacturing interests, large and small seem to dread and avoid over-production, and even in the wonderful expansion of producing capacity going on, the greatest care is taken to not go beyond what is considered safe limits. The wants of the country are clearly studied and pretty accurately known. Our industrial system has had a severe strain and has stood it well. Capital has had surprises and has been intimidated, but is already returning to its work determined to make the very best use of every opportunity. Architects in two or three Western cities furnish the very encouraging information that within the last ten days more work has been undertaken than was projected during the preceding thirty days. Symptoms of returning confidence abound on all sides. The next five or six months will be busy months for architects, builders and manufacturers and business men. The best of industrial and commercial management will continue to be necessary. It will be more difficult to make fortunes hereafter than it has been heretofore. The sharper competition of these later days is inducing capital to seek association under limited or incorporated companies or associations. The underlying influences at work all about us point to lower rates of interest, to large combinations of capital, and narrower margins.

Lieutenant Wissmann, the Congo explorer, having fallen ill deep in the jungle, gave up his trip and is returning to Germany.

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KIOSK IN THE JARDIN MARENGO, ALGIERS.



HELIOTYPE PRINTING CO., BOSTON.

THE BOULEVARD IN FRONT OF THE SQUARE, ALGIERS.

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX
Copyright, 1886, TICKNOR & COMPANY, Boston, Mass.
No. 547.

JUNE 19, 1886.
Entered at the Post-Office at Boston as second-class matter.

CONTENTS

IT is not an infrequent thing, in this country where youth is less a crime than it is elsewhere, for young men of ability to meet with success while they are still young, and it is hardly less common when the success is rapid to find the unfortunate victim fail beneath the load which his own genius brought upon him. We fear that the late Frederick B. White must be added to the list of victims of overwork, and though he may find a place on the long roll of those youths of much promise whose actual deeds the biographer delights to chronicle, and of whose possible future the brightest pictures are drawn, still his friends and associates cannot but regret that the good fortune he probably rejoiced in had not been more evenly distributed. Born in the city of New York in February 1862, and dying at Bloomfield, N. J., May 22, 1886, Mr. White had barely passed his twenty-fourth year, and yet in the three years which followed his graduation from Princeton College he had built over two hundred buildings, and at the time of his death he had in process of construction about fifty others. Of course most of these buildings were small country houses, the opportunity for building which probably came to him through the publication of his designs in the pages of *Building* and other technical journals, to which he was a frequent contributor. Circumstances forced him to support himself while in college by doing whatever architectural work came within his reach, but this seeming hardship really helped to mature his character, and he entered on his short career better able to cope with life's problems than college-bred men usually are. To the manual dexterity of the draughtsman, and the inventiveness of the designer, he added the judgment of the man of culture and the organizing ability of the man of affairs, and so seemed to possess most of the qualifications which the true architect should have. His professional enthusiasms were justly balanced, and the standard by which he measured his own work a high one; and had he been allowed to carry out those more important works which were just beginning to come to him as a reward for his fidelity in small things, we believe he would have left the world some more worthy and enduring monuments of his skill instead of merely the pleasant memory he now leaves his friends.

IT appears that the French and other nations which find themselves obliged to distract public attention from domestic disorder and mismanagement by indulging in the conquest of those barbarous or semi-civilized nations which are little able to resist the armaments a fully civilized (mark the word) nation can bring against them, find themselves, the conquest at length made, confronted with certain architectural difficulties; for it appears that "when one builds in a conquered country it seems obligatory that the b ildings should be exceptionally solid in order to testify that the seizure is definitive; that an impress of elegance should be given the buildings in order to prove to the natives that the invaders are not barbarians, and that everything should be done to dazzle the imagination by the display of power and riches." It seems to be generally accepted that the best way of accomplishing these things is for the conquerors to construct, in a country where there are not the necessary materials and appliances for the work, precisely such buildings as they would have built at home. This theory, which is plausible enough, serves to explain the utter incongruity with the habits and climate of the country, which the ubiquitous traveller, the forerunner of Macaulay's intelligent New Zealander, discovers in the buildings constructed by Europeans in Asia and Africa. It would seem immensely absurd to the wanderer to discover at Haïphong, in Tonquin, on a little reservation of about five acres, a group of such buildings as might be found in any little French town: the stone basement, the balustraded terrace, the double-ramped stone steps, the pilastered façade are certainly sufficiently unlike the bamboo huts just outside the diked enclosure to create almost any kind of an impression on the native mind. But the French are too good architects not to consider climatic requirements in the construction and planning of their buildings, and we find that each building was constructed within a skeleton structure, like the ship-house of a navy-yard, built of bamboos, which supported a large roof thatched with straw matting, so that the workmen were protected from the heat of the sun and the torrents of rain habitual in that part of the world; and that the comfort of the occupants is cared for by surrounding the living-rooms with deep-covered verandas.

IT has long been a matter of some speculative interest why the use of electric energy should have spread so much more rapidly in this country, where the cost of production is greater, than it has in other countries where labor and material are so much cheaper. We have always imagined the explanation lay in the well-known American characteristic which leads us to use the tools best suited to our needs, no matter what they cost. But it now appears that the checking of the development of electric enterprises, in London at least, is due to injudicious legislation, and the good that may be accomplished by the proper action of an association of men is exemplified incidentally, in these times when we are learning so much about association and combination of men interested in the same ends and aims, by the petition which that eminent body, the Institution of Civil Engineers, lately presented to the House of Lords in the hope that they might influence that august body to adopt that one of the three amendments to the Electric Lighting Act of 1882, at that time under consideration, which seemed least likely to embarrass the development of practical electrical work of all kinds.

IT appears that the act of 1882 contained a species of forfeiture clause, by which the local authorities of a town in which a private individual had set up an electric plant for the dissemination of electric energy might, at the end of twenty-one years, or "such shorter period as might be provided by the Special Act" (we presume the act granting a charter to the corporation is what is here meant), or at the end of each succeeding seven years, or "shorter period," seize the entire property, plant, buildings, land and all, by paying to the corporation the value of its property at that time, the act providing for the fixing of the price of the property by arbitration, if the victims of this forced sale could not accept as right and proper the valuation the local authorities had put upon it; and they would be but careless city fathers who would not be foresighted enough to assess annual taxes against a property they meant soon to seize at a figure much less than would be entered on the municipal books in the case of a property over which they held no statutory claim. It does not require very close reasoning to discover that this method of protecting the "rights" of the public by sacrificing those of the individual is several degrees more unrighteous than the common ways of robbing an author or an inventor of right to his own at the end of a stated term of years. The result of this legislation has been that, inasmuch as the development of an electrical business must, particularly in conservative England, be a matter of very slow growth and consequently the limit of protection — we will call it so by courtesy — would, in most cases, have nearly elapsed before the incorporators found their business profitable, few or none have been willing to embark their capital in so precarious a venture. The

amendment which has the support of the Institution of Civil Engineers, practically abolishes the act of 1882 and substitutes one whose provisions are similar to those of the Act which now "so successfully regulates gas undertakings" which, amongst other things, regulates dividends by a sliding scale so that there is "a direct incentive to the undertakers to sell the commodity at the lowest possible price consistent with a profit."

AS it is by no means impossible that the Government of this country, like that of most other civilized nations, may at some time take possession of the telegraph system, we hope that an effort will be made, before the change takes place, to devise some better method of writing and transmitting messages than those now put in practice in some places. In England, for instance, where a new system has just been introduced, under which a very small rate is charged for messages, which, including address and signature, do not exceed a limited number of words, the efforts of the senders to save a few cents by condensing their telegrams into the smallest possible space seems likely to lead to serious consequences. It is common enough here to see telegraph boys wandering about the streets with cable messages addressed to "Smith, New York," or to some other personage equally easy to find, but the recipients of cable dispatches are few in this country, and the good sense of our telegraph companies, which charge nothing extra for addresses or signatures, prevents any confusion in local business. As an illustration of the way in which mercantile negotiations are carried on just now by telegraph in England, we are told that a provincial importer of a certain sort of foreign goods recently telegraphed to a number of brokers in London, asking the prices of particular articles. The brokers all replied promptly, but not one of them signed his name to his message, and the importer, although he secured an excellent view of the market in that particular item, found himself no nearer to purchasing than he was before he sent out his inquiries, since he could not tell who might have been the author of any proposition that he wished to accept.

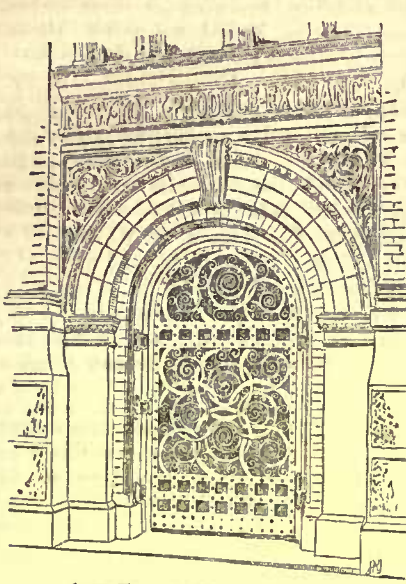
IT is said that the laying of the great subterranean telegraph lines in France and Germany has been followed by some curious observations in relation to the mode in which wires underground are affected by lightning. As a rule, these lines are composed of a number of wires, covered with gutta-percha and collected into a cable, then wrapped with wire, and, finally, laid in a continuous cast-iron tube. It would seem as if wires so protected would be entirely out of reach of disturbances from atmospheric electricity, and the underground lines in the large cities, where they cross and re-cross the network of gas and water pipes, are rarely affected, but the longer lines, which are laid from one town to another in soil of a non-conducting character, often show sparks at the terminal stations intense enough to melt off the fine wires of the lightning-arresters. The current is apparently one of induction, and has never been observed to be very powerful, but circumstances might combine to produce serious consequences in such lines if proper precautions are not taken.

LA SEMAINE DES CONSTRUCTEURS publishes a short note upon a matter of considerable importance to builders. So far as we can gather from the note, a contractor agreed with the officials of a certain town to construct a building in accordance with plans and specifications offered him on behalf of the town. He carried out his contract to the letter, but after the building was completed it showed signs of weakness, and the contractor was called upon to make the work good. He defended himself on the ground that he had faithfully carried out the plans and specifications, and proved that he had done so; but the highest court in France decided that, notwithstanding this, he was bound to make good the defects which had appeared in the building, for the reason that he had neglected to inform the town officials of the improper character of the materials specified, and to warn them that it would be impossible to do good work with them. This decree, which was given by the Council of State on the second day of last April and is reported in the journal *Droit* of the eleventh, will surprise those contractors who think it business-like to conceal their knowledge of defects in plans or specifications in the hope that they will be able to get a good price later for extra work in changing the work done in accordance with imperfect documents, but there can be no doubt that it expresses the general policy of the law. As applied to architects, this policy requires that the client should be clearly informed of the inconveniences or risks which would be incurred in following out his instructions, if the architect, knowing of these inconveniences, would free himself from responsibility for them. Before the law, the architect is always the adviser of his client, and is bound to advise him faithfully. In the absence of explicit instructions, and even, to some extent, in opposition to them, he is clothed with a very extensive authority in directing the conduct of the works which are placed in his charge, and in return for the discretion which the law allows him he is obliged to assume a proportionate responsibility. The client may, in unmistakable terms, take this responsibility away from him, but interference with the architect's work, and even the giving of contrary orders, will not have the effect of shifting the responsibility for the building from the architect to the client unless the former takes care to warn his client against the possible consequence of his actions, so far as he can foresee them.

AT length one of the many schemes for utilizing the water-power going to waste over Niagara Falls seems likely to be tried, as the New York Legislature passed an act in April last incorporating the Lockport Water-Supply Company, with a capital of ten million dollars. The plan, which does not involve any great engineering difficulties, is simply to convey the water of the Niagara River to Lockport, about fifteen miles away, through an open ditch or canal, without locks or dams of any kind, taking advantage of a certain ravine about a mile and a half long, which is found, most conveniently, at a place where otherwise a considerable cutting would have to be made. From Lockport the water is to be sent along, to take up its interrupted journey, by being carried to Lake Ontario through a continuation of the canal, ditch, mill-race, or whatever it is to be called, which can be connected with Eighteen-Mile Creek, and so save eight miles or more of excavation. It is proposed to borrow only about fifty thousand horse-power from the river, though it is said that six times that amount could be taken without its ever being missed, if Lockport were likely to have need for so much; but as most of the New England towns which use water-power have only ten or twelve thousand horse-power at their command, it is thought that Lockport can achieve easily the greatness it desires by the aid of its fifty thousand. In some ways the scheme reminds one of the way in which the power, which for centuries had gone to waste at the Perte du Rhône, was at length utilized, and a force of ten thousand horse-power was made to contribute to the growth of Bellegarde.

WITHIN the past few days the Boston City Government has made a change in the ordinances regarding the occupation of streets for purposes of building, and according to the present reading of the rules more can be required from builders than heretofore. Before the recent amendment it was required that every time a street was occupied for the purpose of building or making alterations, there must be placed a fence on the outside line of the street territory granted, and outside of that fence the licensee was bound to lay down a plank walk. This was the law and laws know no exceptions; but taking the city proper and the outlying wards together, it was never observed in half the building operations. The needlessness of compelling its observance in the suburban wards was readily seen, and there the discretionary power of the inspector came into play. By the amended ordinance, which has now passed both branches of the City Government, any person building or making such alterations or repairs as necessitate his use of any portion of the sidewalk, is required to erect posts outside the passage-way that he provides for foot travel, and to erect a covering over that passage-way. The change has been brought about largely on the recommendation of the inspector of buildings, who desires no discretionary power in the matter, and who complains of having gained the ill-will of certain builders by his refusal to grant them certain concessions that they thought reasonable. It will be interesting to see if the changed ordinance shall be more strictly enforced than the old one was. It will look like a needless annoyance to contractors in many cases, those, for instance, where only slight and brief repairing work is to be performed, and it is not unlikely that a reasonable amount of discretion will continue to be exercised by Mr. Damrell. The whole matter seems to be one that might more wisely be left within the discretionary power of a competent city official. This would be far preferable to the supposed or pretended enforcement of a rather impracticable ordinance, which cannot with justice and satisfaction be applied to different kinds of work in widely-varying localities and surroundings.

NOTES OF TRAVEL.—TOULOUSE.



STREET ENTRANCE OF THE PRODUCE EXCHANGE
GEORGE B. POST, ARCHITECT. NEW YORK

THE first impression given by Toulouse is far from agreeable. A rambling, uncomfortable railway station, a narrow, dirty stream which we are told later is the famous Languedoc Canal, a wide, dusty boulevard and then a confused maze of narrow streets are what appeal most strongly to a stranger's senses; and, indeed, the ordinary traveller who takes things only as he finds them, and is not of a particularly investigating turn of mind, would probably pronounce the city to be quite uninteresting and not worth the car-fare from Narbonne. But Toulouse is full of surprises to the artist and architect; the kind of city in which one will plan to spend a day and will find himself lingering on for a week, to finally leave only with regret at the shortness of so pleasant a period of investigation — that is to say, unless the *mistral* should be blowing from the North, which is enough to make one discontented with almost anything.

The church of St. Sernin is naturally the building which first claims attention, being the most conspicuous and pretentious as well as in some respects the best piece of architecture the city affords, while at the same time it is a fair sample of what may, with a certain degree of propriety, be termed the Toulousaine style of brick architecture. There has yet to be made a comprehensive study of the European brickwork which rises to the dignity of style, but whoever undertakes such a task will find a great deal to draw from in the extreme Southern provinces of France. There is no lack of good building stone at Toulouse, if we may judge by what has been done in past times, but at one period, about the thirteenth century, brick seems to have been greatly in favor, and was used with considerable taste in a manner quite different from that adopted in either North-western Germany or the valley of the Po. In general, the forms can be said to be taken pretty directly from stonework, moulded bricks and a few carved stone details being combined with results quite as effective in their way as though nothing but stone were employed. So far as general style goes all the brick buildings are more Romanesque than Gothic; indeed, the later style made little impression on these Southern provinces, and when the Renaissance movement began, brick was practically abandoned altogether. In St. Sernin the walls are of brick, while the window-facings, the roofs, and in general all the ornamental features are of stone. The work has, nevertheless, a very bricky appearance, if such an expression may be allowed, and especially is this true of the apsis and the tall, central tower, both of which are shown on the sheet of sketches. Generally considered, a tower with so many strongly-marked divisions would be fussy and tiresome, and as it is, it does not altogether escape such a fate, though the angle columns, the connecting belt-courses, and especially the bold upper portion help to give considerable dignity to the whole, so that, when seen from the point chosen for the sketch the tower composes quite well with the church. It hardly seems a rational way to pile five stories one above the other, cap them with a tall brick pyramid and call the whole a tower; but with so unmanageable a material as brick any other treatment would hardly be successful. A plain shaft would be quite out of keeping with the church. It may be remarked in this connection that while there is plenty of Gothic and Renaissance brickwork all over Europe, only in Toulouse and the vicinity has the Romanesque been adapted to this material.

The apsis and the tower are the most interesting portions of St. Sernin, although there is a very good Romanesque south portal preceded by a monumental Renaissance gateway, which has some quite delicately-designed details. The interior of the church is rather disappointing, notwithstanding the fact of its having been restored by Viollet-le-Duc. No brick is used, as such, for the interior, all of the isolated piers being of stone. The choir dates from the end of the eleventh century, and is pure Romanesque in style, with few details and an abundance of plain wall-surface. The construction of the nave extended through the twelfth and thirteenth centuries, and the west portal, in florid late Gothic, remains uncompleted. In plan, the church is five-aisled, with unusually long transepts and a circular apsis with semi-circular chapels. A peculiarity of the arrangement is that the principal entrance, or, at least, the one which is used as such, is not in the transept but opposite the centre of the nave. The construction is internal; that is to say, buttresses do not appear to any extent on the exterior, and the flying buttress, which is so marked a feature of all Northern Gothic work, disappears entirely. The dimensions of the church are three hundred and eighty feet in total length, two hundred and one feet in width across the transepts, and one hundred and six feet across the nave. The height of the central vaulting is sixty-nine feet — rather unusual proportions.

The tower of St. Sernin is not wholly of brick, as the shafts and carved members are of stone. The old church of the Jacobins affords an excellent example of what can be done without any stone whatever. The tower of this church is placed at one side, opposite the centre of the nave. It is octagonal in plan, with a plain, unbroken base rising to a height of perhaps forty-five feet, above which the disposition is essentially the same as that of the tower of St. Sernin. The shafts are made with moulded brick, the belt-courses are likewise of toothed or moulded work, and what shows of the roof is brick or terra-cotta, more likely the former. The details are, of course, quite simple, but the proportions are excellent and the tower builds up very effectively from the plain base to the fretted cresting about the top. Unfortunately, it is so surrounded by buildings that it is impossible to find any stand-point from which a sketch can be made.

Another hardly less interesting example of the old brickwork is the uncompleted tower adjoining the convent church which is now occupied by the Museum. The style is the same as in the two other examples, but the moulded shafts about the windows are used more freely, the proportions are easier, and had it been completed the tower would have been far superior to anything else in the neighborhood. Here, as in the church of the Jacobins, everything is of brick.

By reason of its architectural importance no less than its size, St. Sernin deserves to be called the cathedral, but this honor is arrogated by the church of St. Etienne, at the other end of the city, a structure which, from a strictly architectural standpoint, has little to recommend it, but which forms, both inside and out, the most unique piece of picturesque interest in Toulouse. The cathedral faces upon an irregular square. On the right of the façade is a tall square tower with a plain shaft unbroken except by a heavy buttress projected from the front to support a clock dial which is placed about three-quarters of the way from the ground. The top of the tower is crowned by a nondescript Renaissance gable wall pierced with an arch in which is hung a huge bell, while smaller bells are balanced on pedestals placed on each corner of the tower. At the right appears the outline of the gable, sloping away down on one side and stopping short against the tower in a one-sided manner which gives an interest the architecture cannot afford, for the huge rose window is a clumsy thirteenth-century affair, and the portal beneath, far on one side, is of the sixteenth century, and utterly commonplace. The interior of the cathedral is very striking in appearance, especially if one can see it about sweeping-time just after half a dozen brooms have raised a dim, religious cloud in the church — not a difficult thing to do, by the way, for the interior never seems over-clean, and Toulouse is notoriously a dusty city. Those who have seen *Faust* as it is performed at the opera-house in Paris will readily believe that the artist who painted the scenery for the fourth act must have drawn his inspiration from the Toulouse cathedral. At any rate the effect of both is the same. One enters a broad nave, in a single aisle, beneath a low, barrel vault. The view at the end is broken by a single, huge, round pier rising just as the pillar before which Marguerite prays, and disappearing behind a low round arch just as the painted pillar disappears behind the drops. And in the distance, at the left, is a half vista into a richly elaborate choir filled with carved stalls, shining brasswork and deep-toned marbles, while a corner of a Gothic vault and a heavy red curtain close the scene over which the strong-colored light from a few windows high on one side throws a theatrical glow such as is seldom seen in a cathedral. But it is a disappointment, in spite of its picturesqueness. The choir is rich, but decidedly bad; the stained-glass glory comes from modern windows, poor in design; and when one reaches the choir-rail and looks back all the charm disappears and there remains only a badly-built, half-finished church. The single-aisled nave appears to have been the original building. In the late Gothic period the choir was torn down and the present one built, but with its axis on a line with the left wall of the nave, the intention being doubtless to eventually complete the whole on the same extensive scale. Perhaps the Albigenses objected to the scheme. At any rate, the cathedral remains uncompleted, and, considering the effect from the entrance, one can hardly wish it otherwise.

There is but one other Toulouse church which attracts any attention. The church of Notre Dame la Blanche, locally known as the Dalbade[1], has an interesting square brick tower and an attractive portal of the early Renaissance period, in the tympanum of which is a noteworthy attempt at decoration in the way of a large group in terra-cotta, modelled in high relief and glazed and colored in Della Robbia style, an exact copy of Fra Angelico's celebrated painting of the Coronation of the Virgin, which is in the Museum of the Louvre. It is interesting as an attempt, though the success thereof is doubtful, especially as Fra Angelico hardly seems to call for the early Renaissance setting which is here employed.

There is a great deal of Renaissance work in Toulouse, for the most part quite early in style, and seeming more like Spanish work than anything of purely French origin. The Hôtel de Ville had considerable work in this style, but it is now being torn out to make place for modern improvements, so that nothing will remain but one large portal in an inner court. Near the church of the Jacobins is an old *hôtel*, originally erected by Bernuy, the Spanish merchant,

[1] See pages 103 and 147.

who gave his bond for the ransom of François I. The building now forms a part of the Lycée, and the fine court-yard is being judiciously restored by the *Commission des Monuments Historiques.* The sketch shows the most pleasing corner of the court. The work is so decidedly Spanish in appearance that it is more than probable a Spanish architect gave the design. Besides this there are Renaissance *hôtels* in Toulouse of all grades of excellence and style. Most of them are fragmentary or in ruins, or are so hidden away among modern constructions that it is not easy to find them, though they are none the less interesting when found, and cause one to eye every old house curiously, for there is no telling what rare treasures may be concealed behind a bare stucco wall. The large gateway shown on the sheet of sketches is one of these stray bits, a fragment of the arsenal, and in a much more dilapidated condition than would be inferred from the drawing. The Hôtel Lasbordes is one of the many structures due to Nicolas Bachelier, a Toulouse architect who flourished in the early part of the sixteenth century, and endowed his city with the best of the old work now remaining, besides building the long, irregular bridge over the Garonne which continues to bear the name of the Pont Neuf.

The Museum of Toulouse has the reputation of being one of the richest and most interesting outside of Paris, and it certainly is such in some respects. It is installed in an old convent which itself is hardly of less interest than the collections. The entrance is into a small cloister, a charmingly picturesque bit of Renaissance work; brick pilasters, low, broad arches, a stuccoed wall above broken by a few simple windows and some niches for statues; a shallow brick cornice neatly proportioned to the whole, a heavy ivy climbing over one corner of the court, a white marble Diana put upon a pedestal in the centre against the strong, dark tones of the brickwork; a fountain plashing gently in some hidden nook, and the warm flood of southern sunshine which makes almost anything pleasing; not a great amount of architecture, perhaps, but a very comforting spot to come to and meditate upon whether architects were not much happier before such things as T-squares and triangles were invented. Adjoining is a larger cloister enclosed by an open arcade, with coupled columns and lobed arches, which remind one that the Moors were masters of Toulouse for a short time, and left an influence behind them, when they were driven back across the Pyrenees. In this cloister were formerly kept most of the antique fragments found in the vicinity of Toulouse, foremost among which were the Romanesque capitals and fragments of carving so familiar to all who have studied Henri Revoil's "*Architecture Romane.*" Lately the Government decided to enlarge the Museum, or rather to render habitable certain portions of the old convent, and now the fragments are piled together in a side-room where they are inaccessible to the general public, though a little silver will usually unlock the doors. The paintings in the Museum are like those in most of the French provincial collections — only the leavings of what Paris did not want, with a few pieces of merit by local artists.

Toulouse is a convenient centre for excursions in several directions. To the north is Albi, too well known to require comment, and Cordes, one of the most picturesque cities in Southern France, by reason of its well-preserved ramparts and towers of the thirteenth century, and its quaint old houses of the same period. Close by is St. Antonin, with a curious hôtel de ville of the twelfth century. To the west is Moissac, and near it the little village of Laynac, whose fine Romanesque church merits study. Farther on the same line is Auch, claiming the finest Gothic cathedral in the south of France, though that does not necessarily imply very much. And finally, to the east are Carcassonne, Narbonne and Elne, each with a store of Romanesque and early Gothic architecture. One who cares for this old work, and is willing to put up with the discomforts of poor hotels can easily pass a month in and about Toulouse to good advantage, and then not exhaust the country. C. H. Blackall.

Electric Cars at Blackpool. — To Blackpool, the Lancashire Brighton, is due the credit of introducing to a doubting public an electric-tram service so constructed as to be of no more hindrance or danger to ordinary traffic than is the common horse-tram. The realization of this as a work-a-day fact, even in a holiday resort like Blackpool, is a hundredfold more impressive than the sight of it in an exhibition such as the Inventions last year. The principle is very simple. Under each car is an electric motor of eight horse-power, and the electric force necessary to set the engine in motion and keep it at work is conveyed by a flexible conductor hanging from the car, which is in contact with a pair of continuous copper tubes in the slit below the roadway. These copper tubes are stored with a constant supply of electricity, and from them the electric motor draws through its conductor, which travels along with it, just as much or as little power as it may happen to require. Exactly in the same manner as a steam-engine takes steam from the boiler in proportion to the power required, so does the electric motor draw upon the electric force in the conductors. It is, in fact, as if a locomotive steam-engine could take up its steam while in motion, as some of the express-engines now take up water, freed from all the weight of boiler, water, and coal, and having simply the cylinder which transmutes the steam-pressure into horizontal motion in the direction required. The ultimate source of power is, as is frequently the case in more kinds of power than this, modestly withdrawn from public vision. There are the steam-boilers and the heavy mechanism for the generation of the electric force, which is transmitted continuously into the copper conductors ready for the requirements of the motors. This may or may not be the beginning of a revolution in locomotion, but at least there is no room for doubt as to the possibility of electricity being adapted for this purpose.—*Pall Mall Gazette.*

PICTURES OF THE SEASON IN NEW YORK.[1] — IV.



I DO not think that the Sixty-first Annual Exhibition of the National Academy of Design calls for any very extended notice in this place. More and more the Academy shows are losing their former prestige in the eyes of all who are really interested in art — either as producers or as amateurs — though much of it still survives with the "general public." The average of the pictures shown this year was certainly higher than it would or could have been a generation ago; but was as certainly low compared with what it ought to have been to-day. Innumerable canvases appeared, fresh from the studio, which savored of a period that — were it not for these very exhibitions—we might call historical; canvases which made us question whether we had really grown very much in art since they could be tolerated by any committee of admission. Side by side with them hung very many others which, being merely commonplace and uninteresting, had a certain worth by contrast; and then there was a small sprinkling of really good things with very, very few of exceptional interest or charm. Mr. Inness was easily first with a beautiful large "Wood Interior," and several smaller landscapes. Mr. George Inness, Jr., showed an interesting storm-threatened landscape with horses; Mr. Porter an attractive but not wholly excellent portrait of a beautifully-dressed young woman; Mr. Frank Millet a charming interior and a delightfully-painted figure of a Greek girl; Mr. Barse — a new comer, if I mistake not, but evidently a well-trained painter — an "Interior of a Plaster Shop," remarkable not only for the treatment of white tones in strong light, but for the characterization of its single figure; Mr. Alden Weir the head of a young girl, called "Reverie," that was beautiful in execution, and charming in sentiment—one of the most thoroughly artistic though not one of the most striking products of the year; Mr. Butler an "Italian Peasant," savoring strongly of the mere model, but not without much attractiveness; and Mr. Lippincott, a very well-painted girl's head. And there were also good and characteristic if not remarkable examples of Mr. Bolton Jones, Mr. Ross Turner, and Mr. F. S. Church. The best portraits were a somewhat eccentric and mysterious, but very vital and artistic half-length of Dr. McCosh, by Mr. Alexander, and a fine and vigorous likeness of a physician, by Mr. Eastman Johnson. It is a discouraging fact to note that, with all the good portrait-painters we have to-day — the two just named being but examples among many — the "official" portrait so seldom, even yet, falls to accomplished hands. In this exhibition, for example, we had to set against the one confided to Mr. Johnson by the College of Physicians and Surgeons, three which had been given to the brush of the P. N. A.,—who can certainly not be said to improve with the lapse of time. Two of these were commissions from Cornell University, and the other from the Massachusetts Historical Society. One cannot but forgive the "general public" for so often going astray in its judgments, when one remembers that it is just such bodies as these which ought to lead it in the better path; ought to teach it that artistic excellence is a matter to be decided upon other grounds than those of nominal rank and time-worn prestige.

The three Hallgarten prizes, bestowed by the votes of the exhibitors at large, fell respectively to Mr. Percy Moran, for an extremely well-painted, sufficiently individual and very attractive interior with two figures — one of the daintiest trifles we had seen for a long time; to Mr. Irving Wiles for his "Corner in a Restaurant," which had a single actual figure with others seen in the mirrors' reflections, and was very cleverly handled; and to Mr. Coffin for a very good moonlit "Harvest Field." With none of these awards was one inclined to quarrel; but there has been well grounded and universal discontent expressed with the award of the Clarke prize "for the best figure-composition painted in the United States." Here again the exhibitors were the voters; but, we are told, Mr. Satterlee's picture—as weak in idea as in execution—was selected rather because of his personal popularity with the younger generation of exhibitors (among whom he has many pupils) than in strict accordance with really conscientious judgments. I do not like to gossip—in print—and I hope I have a due sense of the fact that unkind personalities are everywhere to be avoided. But the statement just made has been so often printed already and, so far as I have been able to discover, without any contradiction following, that it can hardly be called gossip now. And whatever unkindness it may hold as regards one artist, is offset, I am sure, by the fact that it is but simple justice to many others to say that the prize was infinitely better deserved by them. If awards of this sort are to mean anything at all — are in the least to further

[1] Continued from page 175, No. 537.

the generous wishes of their founders — it is certainly right that the public should be told if there is any patent miscarriage of justice as regards them.

An interesting picture which was out of the competition—as not having been painted in America — was Mr. Robert Koehler's "Strike," which showed a dreary, smoky common with "works" of some sort in the background, and in the foreground an excited group of laborers parleying with the master who stands upon the steps of what, I imagine, was meant to be a "palatial mansion." Neither in the suggestion of this, nor in the characterization of the master was the artist very successful; and the groups of workmen, though well composed for general effect, were not very dramatically realized to close inspection. But there was much good painting on the canvas, especially in the background and atmosphere; and though one could not call it a real success, it was an encouraging sign of earnest ambition and the effort to grapple intelligently with a characteristically modern subject.

There were other good things in the exhibition, of course, notably among the landscapes. Yet nothing remains which seems to me to call for special notice save Mr. Warner's excellently realistic yet artistic bust in plaster of Mr. Blair.

The "Impressionist" exhibition, as every one must have heard by this time, has been the great sensation of the year. I mean among the inner circle of the initiated or the would-be initiated in art. In popular attraction it has not even remotely rivalled the Morgan collection; but the two together have certainly made this a marked season in our local history. There is so much to be said about the Impressionists that I am almost afraid to begin; and it will be better to wait perhaps, until, after a brief period of eclipse, they are again put on exhibition, and can be studied in that soberer mood, which comes when the first blush of novelty has passed away. Their season at the American Art Galleries was necessarily short, as the rooms were engaged for the Second Prize Fund Exhibition. Their sponsors profess themselves satisfied with the amount of attention they there received, but believe it would have been greater the longer they had remained on view. So they decided to give them another chance, and have actually secured for this purpose the Academy of Design itself—a conjunction of ideas which is somewhat suggestive of Saul among the prophets!

The Second Prize Fund Exhibition now open, and hereafter to be transferred to other cities, is, I am told, much better than the first, which I did not see. Certainly it is remarkably good—especially if we remember that it has occurred at the same time with the Academy show, and with that of the Society of American Artists which is also now open at the Metropolitan Museum. Few of our most noteworthy artists are represented, but the high general average is only the more cheering on that account. We can dispense for once with canvases of exceptional individuality and power since the general level of those we have is so respectable; since they give such gratifying evidence of a widespread desire to deal seriously with art — to study its methods diligently, and then to use them earnestly, straightforwardly, conscientiously, unaffectedly.

The money subscribed this year gave four prizes of two thousand dollars each. The awards — decreed before the exhibition opened, were made by a committee of the subscribers, and with one exception have been generally confirmed as wise. This exception is Mr. Clifford Grayson's "Mid-day Dreams," which shows a French peasant-girl sitting, lost in revery, on her wheelbarrow in a potato-field. It is undoubtedly a good piece of student's work, but I think, nothing more. Many parts of it are well painted, but in others there is comparative inadequacy; and the sentiment of the conception is hackneyed, and moreover, not very clearly expressed.

Another prize was taken by Mr. E. E. Simmons's "Mother and Child," or "Poverty," as the name has also been given. Here again, the subject-matter is drawn from French peasant life; but in this case there is such individuality and such reality and strength of sentiment that one is quite content to have it so. It may seem as though "the short and simple annals of the poor" had been told to exhaustion upon canvas; but this mother, fallen asleep over her potato-peeling with her head on her baby's bed, strikes us as a new figure imagined in a most tenderly sympathetic way, and painted boldly and faithfully without any touch of sentimentality in conception or would-be prettiness in effect. The awakening baby is perhaps a thought less successful; but the picture as a whole is something more than a good bit of workmanship or a good intention—it is a *good picture*—one in which technical ability has been turned to intellectual purpose without detriment to purely pictorial success.

These two canvases show life-size figures, but the other two prize-winners have worked on a smaller scale. Mr. Millet's "Interior of an Inn," explained by the well-known quotation from Shenstone, is a most dainty and accomplished piece of work, and not lacking in the clear expression of the suggested sentiment. The conception speaks too strongly of Mr. Abbey to have the charm of originality and the scheme of lighting — a broad, clear illumination falling in through the wide, low window, beside which sits the young cavalier about to feast on the viands supplied by the pretty servant maid — has been so often resorted to of late that one would almost resent its recurrence were it less delightfully handled. Yet on the whole Mr. Millet has never done so wholly satisfactory a piece of work—one which is so truly a picture, and not merely a study of some attractive figure. Under the circumstances it certainly deserved its prize, though if a somewhat similar work by Mr. Carl Marr had not been excluded from competition by the fact of its previous purchase by a private owner, it might have made good its claim to the reward instead. The canvas in this case is of larger size, but the scheme of lighting is the same. There are again two figures, but in this instance they are young Dutch women spinning. The title — "Gossip" — is well interpreted, without over-emphasis; the scheme of color—light and almost neutral save for a difficult blue in one of the dresses—is very delightful, and the handling throughout extremely accomplished. We have rarely given us, in an exhibition by American hands, so wholly masterly a passage as the window-ledge with its flowering plants in this canvas; and rarely indeed a canvas in which we care so little to pick out one item of interest and forget the rest. Mr. Marr, I may add, is a young artist from Cincinnati, who, a few years ago, frequently appeared as an illustrator in our magazines, but of late has been studying at Munich. One cannot but think there is small need for him to study longer — cannot but wish he may now come home, and devote his accomplished brush to the portrayal of American themes, and the working of a new instead of the re-working of an old artistic quarry.

The fourth prize-taker is Mr. Ulrish, who began two or three years ago, with admirable representations of artisan-life in New York but has since transferred his affections to Venice. His prize-picture shows the interior of a glass-blowing establishment with numerous figures of workmen and on-lookers. Neither in composition nor in the scheme of lighting — which essay to render the double illumination of daylight and ruddy furnace-glare — is there as much unity as might be desired. Yet a very complicated task has been very well accomplished, and it is a pleasure to see so serious an effort to deal with a difficult problem in a straightforward way — with an effort after reality and not after more specious effectiveness. This picture, too, well deserves the award which fell to it. And yet there is something to be said in the way of criticism of *all* the awards. In a contest planned, as this avowedly is, to foster the best interests of native art it seems to me that some regard ought to be paid to choice of subject, or some account taken of the artists' wish or no-wish to be American in art as well as in birth. Of course I know there is an artistic plane that lies above all considerations of nationality. Where ideal art is in question, then all we need ask or can ask is that the executive should be — an artist. And if our conditions were different—if we already had a national school devoted to the portrayal of national life — then it would matter little if this painter, or if that should stray away to foreign lands and try to reveal to us something new and unfamiliar. No one would think, for instance, of blaming a French plainter, who, like Decamps or Fromentin, should paint the East, or like Tissot, should cross the Channel for his themes. There are enough men there to stay at home and give the motherland her due, and prevent the possibility of the entire expatriation of French art. But with us the case is different. Our new material is at home—we go abroad merely to find what is old and hackneyed; and the measure savors, not of ambition but of pusillanimity. We paint French peasants and Dutch maidens and German boors, not because they are good and virgin subjects, but, on the contrary, because they are easier to paint since so many men have already shown us how. Once in a while there comes a good result — such as Mr. Simmons's in this exhibition; but more often—as with Mr. Grayson's pictures — we feel that we are looking merely at a reflex, hearing merely an echo, praising merely an imitation. When we get, by chance, what I may call an "international" picture (borrowing a term from the criticism of current American fiction), we are very grateful. Such a one, for instance, was that excellent "Dutch Inn Garden," by Mr. Chase (described here at length some weeks ago), which had a foreign title and a foreign background, but in which the figures were palpably American and the whole result American, I am sure, in expression. And we are still more grateful when nothing is borrowed—when we see an effort to deal straightforwardly with what the gods have given us at home. It is not a poor gift, believe me; and one of the most hopeful facts to record of the present exhibition is that so many of the youngest generation of exhibitors show a serious desire to accept it for what it is worth.

Mr. Gilbert Gaul, for instance, sends a small canvas called "Holding the Line," which shows a group of soldiers in the very heat and passion of conflict. If it is a little astray in composition—having, I think, two focal points instead of one — it is so cleverly painted, evidently so seriously felt, and so dramatic in its characterization of the different figures, that one is tempted to forget all fault-finding in simple satisfaction. Larger and more ambitious is Mr. Trego's "Battery — Halt!" with its long line of mounted men in a delightfully realized gray atmosphere. There is too much evidence that "*The Horse in Motion*" was studied in preference to horses in motion, as they would have appeared to the artist's actual powers of vision, and the bodies of the steeds have been given too shiny and metallic a texture. But in composition, in dramatic life, and in individualization of character there is very much to praise; and again, in general seriousness of aim and effort.

M. G. VAN RENSSELAER.

MR. B. P. TROWBRIDGE, son of Professor William P. Trowbridge, of New Haven, has been appointed supervising architect of the new building to be erected for the American School of Archæology at Athens, and will leave for Greece in July.—*Boston Journal.*

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE ROTCH TRAVELLING SCHOLARSHIP DRAWINGS — PLATES XIII, XIV, XV, XVI.

[Issued only with the Imperial edition.]

THE CATHEDRAL, TOULOUSE, FRANCE.

COURT-YARD OF THE MUSEUM, TOULOUSE, FRANCE.

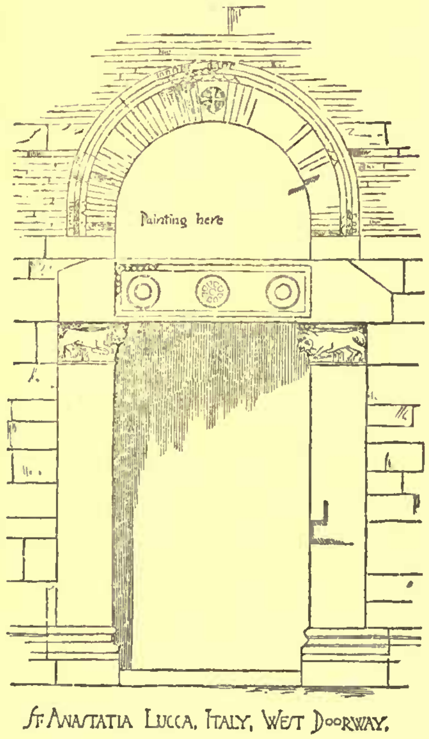
SKETCHES AT TOULOUSE, FRANCE. BY MR. C. H. BLACKALL, ARCHITECT.

For description, see "Notes of Travel," elsewhere in this issue.

HOUSE FOR HON. H. P. DENMAN, WASHINGTON, D. C. MESSRS. WHEELER & FULLER, ARCHITECTS, ALBANY, N. Y.

PRESBYTERIAN CHURCH, MT. HOLLY, N. J. MESSRS. PURSELL & FAY, ARCHITECTS, PHILADELPHIA, PA.

THE HISTORY OF STEEL.[1]



St. Anastatia Lucca, Italy, West Doorway.

After Lawdon A.A. Sketch Book

HAD the question "What is steel?" been asked twenty-five years ago, said the lecturer, there would have been no difficulty in giving an answer, which, if it had not been the correct one, would at least have been one on which all metallurgists would have been agreed. But twenty-five years have brought about most wonderful changes in steel and steel making. The manufacture of iron and its conversion into steel has been so changed by new and rapid processes, and such wonderful results have been accomplished, and are now being accomplished, that the oldest and ablest men engaged in the art stand timid and uncertain as to what may yet be brought forth. By these newer methods of converting iron into steel the gradations of quality have been made so gradual that it is now very difficult to say where the iron leaves off, and where the steel begins.

Steel is at the same time one of the most useful, and one of the most remarkable of metals. Its origin, nomenclature, and its ever-varying relation to iron, have puzzled the ablest metallurgists of the world, and to-day it is as far as ever from being a settled question. But wonderful as is its composition, and wonderful as is the effect upon its composition by even the slightest addition, increase or absence of any one of its component parts, its behavior is more wonderful than all else, and far more difficult to be accounted for. In the times when the fate of empires, as well as of individuals, was settled by hand-to-hand encounters, warriors were wont to speak of their "trusty blade," but trusty as they thought them there often came a time when they snapped asunder without note of warning. In romance and song we are told of the noted steel blade of Saladin, whose matchless temper and keen edge, handled with the dexterity of its owner, would cleave in twain the most gauze-like texture the looms of Cashmere could produce as it floated in the air, while the massive sword of different temper, wielded by the powerful arm of Richard the Lion-hearted, would at one blow sunder a bar of iron.

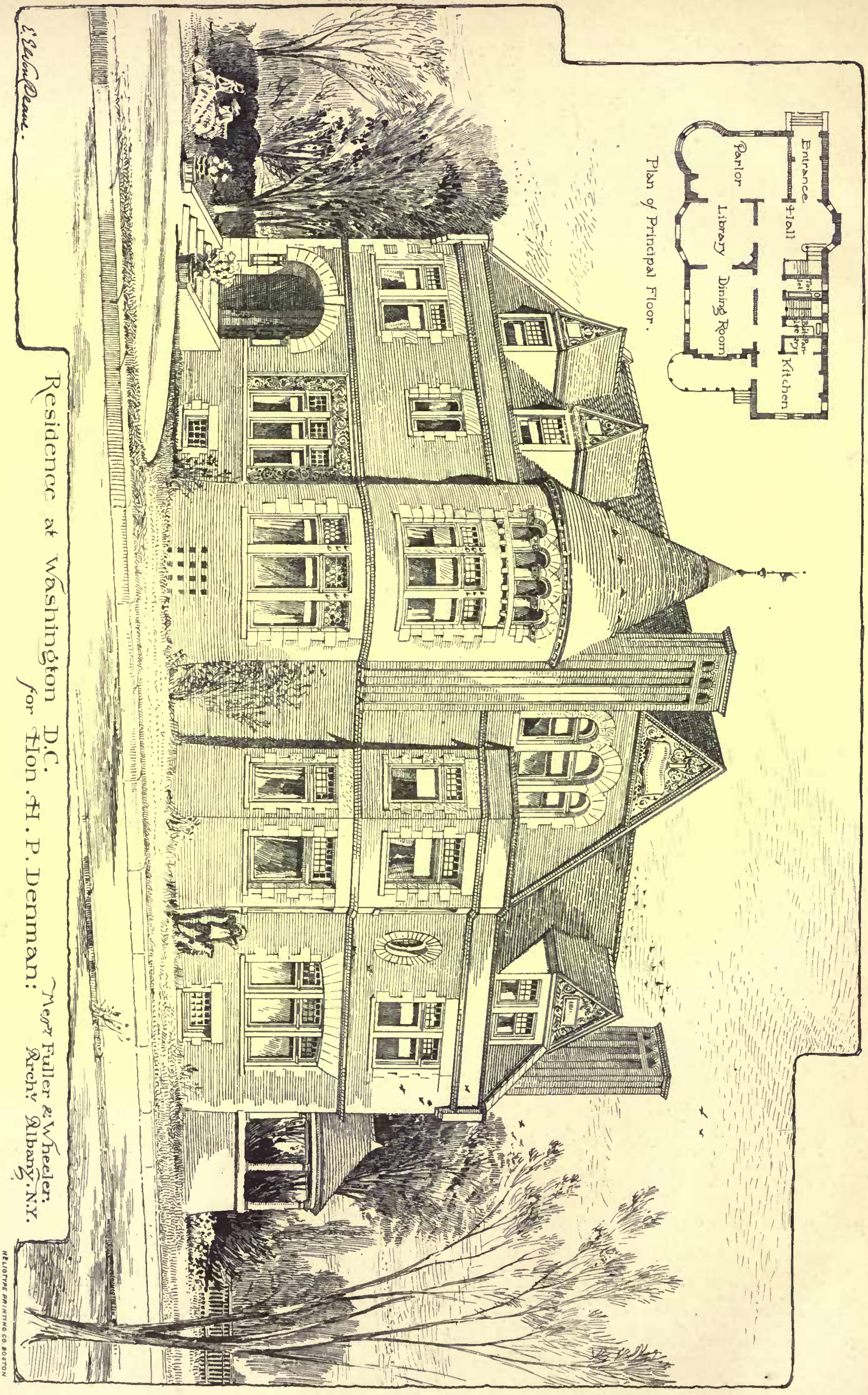
In a general way it may be said that all metals, whether known as cast-iron, wrought-iron, malleable-iron, shear-steel, blister-steel, cast-steel, as well as open-hearth, Bessemer, Chrome, Clapp-Griffiths and other steels, are one and all iron having different percentages of carbon, silicon, phosphorus, sulphur, manganese, etc.; and the strength, ductility and hardness of these various metals are influenced almost entirely by their composition, rather than by their mode of manufacture. There is no question about which there is more disagreement than there is about the proper proportions which should be had in the composition of good steel, and there is no more puzzling question than that of accounting for some of the wonderful things that happen, both in making steel, and in using it for structural purposes.

Passing over the scriptural references to this metal, and the uses known to have been made of it by the people of India in the days of Alexander, and centuries afterwards by Christian and Saracen in the Wars of the Crusaders, the lecturer chose a date a little more than one hundred years ago, as that when steel-making may be said to have had a beginning in England, from which it has grown in importance up to the present hour. About this time there was living in Sheffield, Eng., a man by the name of Huntsman. He was a watch and clock maker, and he had so much trouble in getting a steel that would answer for his springs, he determined to make some steel himself. He experimented for a long time in secret, and after many failures he hit upon a process that produced a superior quality of steel. The best steel to be obtained at that time was made by the Hindoos, and it cost in England about $50,000 a ton; but Huntsman's steel could be had for $500 a ton, and as he found a ready market for all the steel he could make he determined to keep his invention secret, and no one was allowed to enter his works except his workmen, and they were sworn to secresy. But other iron and steel makers were determined to find out how he produced the quality of steel he made, and this is how they accomplished it at last. One dark and bitter cold wintry night a wretched-looking beggar knocked at the door of Huntsman's works and asked shelter from the storm that was raging without. The workmen, pitying the supposed beggar, gave him permission to come in and find warmth and shelter near one of the furnaces. In a little while the drowsy beggar fell asleep, or at least seemed to do so, but beneath his torn and shabby hat his half-shut eyes watched with most eager interest every movement made by the men about the furnaces, and as the charging of the melting-pots, heating the furnaces, and at last pouring the steel into ingots took several hours to accomplish, it is hardly necessary to add that the forgotten beggar slept long, and, as it seemed, soundly, in the corner were he lay. It turned out afterward that the apparently sleeping begger was a well-to-do iron maker living near by, and the fact that he soon began the erection of large steel works similar to Huntsman's was good evidence that he was a poor sleeper but a good watcher.

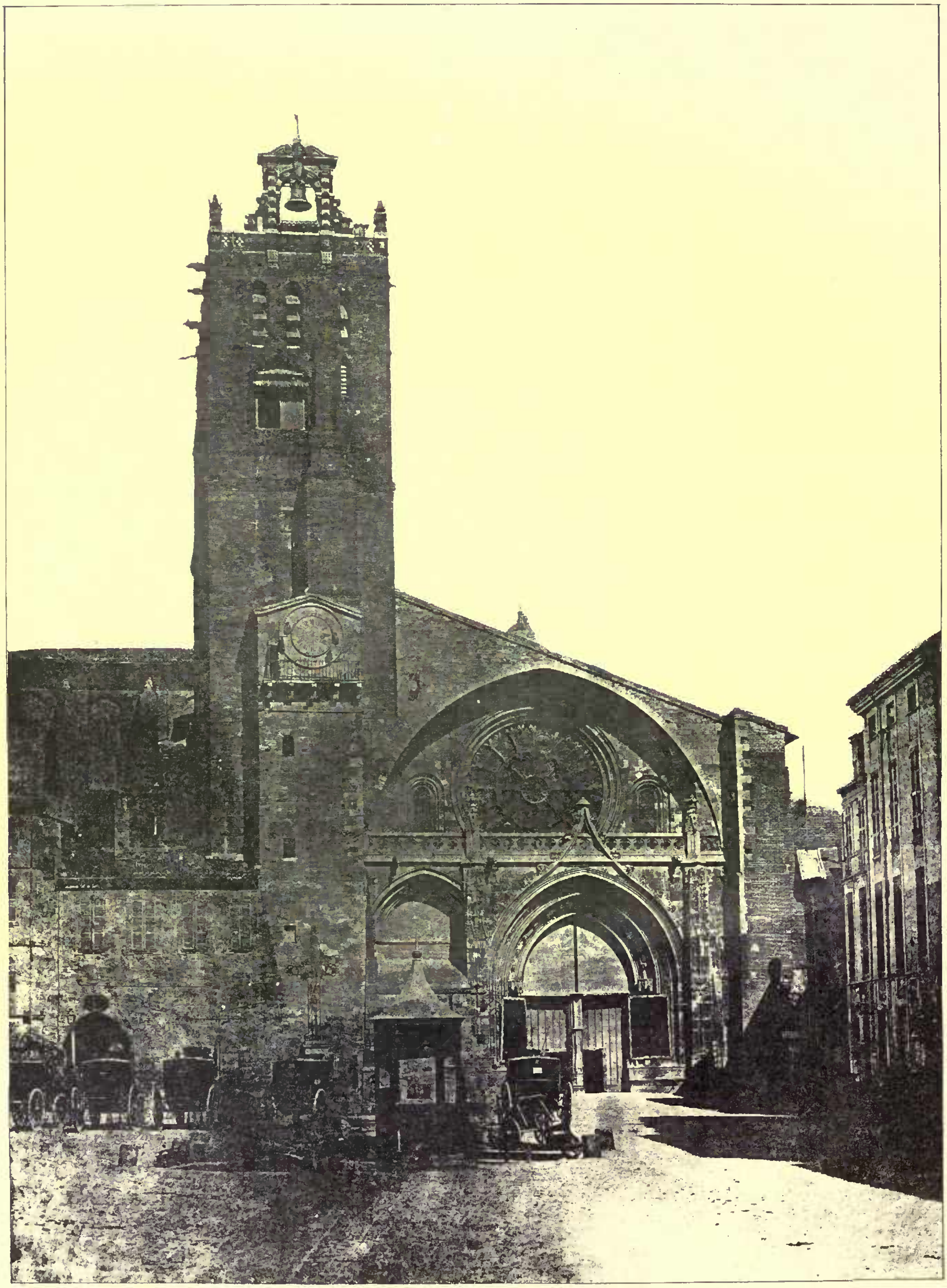
From this time on Sheffield grew, to become the great steel centre of the world, and it doubtless would have continued as such but for the invention of another Englishman, who like Huntsman, was no steel maker, but who has made an invention in the conversion of iron into steel that has revolutionized not only steel making but numerous other industries, which use for their prosecution that metal in various forms. The name of this great inventor is Henry Bessemer. He was born at Charlton, in Hertfordshire, England, in 1813. While still a young man he showed a decided genius for mechanical pursuits, and his father wisely purchased for him a beautiful Holtzafbel foot-lathe, on which he early began what has since become a splendid career. At the age of eighteen he left home for London, knowing, as he has since said, "no one;" he, however, on his arrival there, began work as an engraver and modeller, and soon found plenty to do. But he had a genius for inventing as well, and hearing in some way of the enormous frauds practised upon the Government by the use of counterfeited and cancelled stamps, he began the study of the subject; and after a long time produced what he thought was a very much better system. It seems that he succeeded in producing a very elaborate and costly stamp, which required skilful workmen and elaborate machinery, such as only the Government could afford to make. It was at last proved to the satisfaction of the stamp department that by its adoption, and by securing the services of the inventor, to superintend their manufacture, the revenues of that department would be largely increased. At last, after much time had been consumed by the negotiations, an arrangement was perfected by which both his stamp and his services were secured to the Government. It seems that he was at this time engaged to a young lady, and was only waiting to obtain this position, in order to be in a position to marry her. Feeling that the consummation of his hopes was near at hand he went to pay a visit to his intended, and believing that she would be equally interested in the invention which would add so much to their future happiness, he took with him a sample of the stamps he had designed and explained to her the difficulties to be overcome, and how he had succeeded in overcoming them. He explained that one of the most desirable things to be accomplished was to so make the stamp that it could not be used more than once. As the young lady looked at it she said: "If you could print the date on it, that would prevent its being used again." The idea struck him that he could make the die so as to insert movable type, so that the date might be changed daily. He at once changed his device; but little did he or the young lady dream what would be the result of the improvement. Mr. Bessemer, relying upon the good faith of the Government officials, with whom he had so long been negotiating, took his new and improved stamp to them for their inspection; and to the credit of the Government officials be it said, they at once saw the value of the improvement, and what was more, they saw that by adopting it they could use their old stamp dies, and could also do without any stamp superintendent. So they coolly ignored the invention and the inventor, and, as he afterward said, "I had no patent to fall back upon, and I could not go to law if I had wanted to do so,

[1] Extract from an address delivered by M. J. F. Holloway, President of the Cuyahoga Steam Furnace Co., and published in *Iron*.

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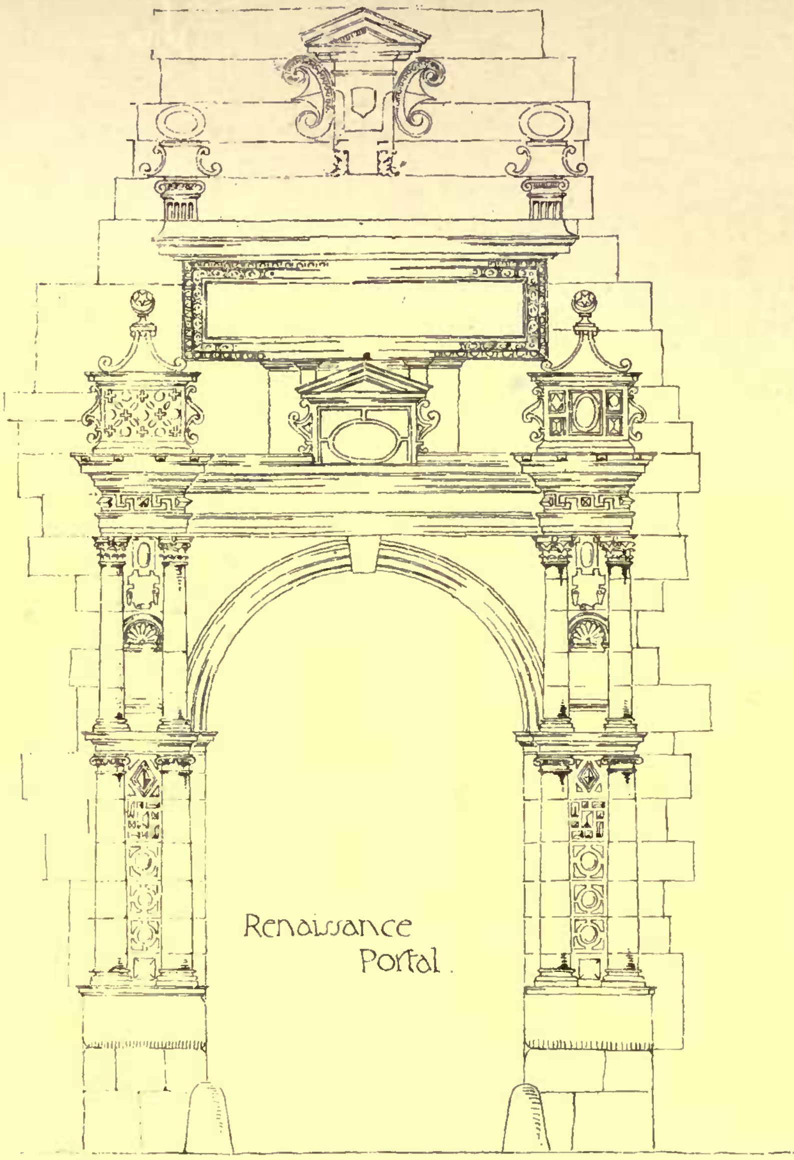


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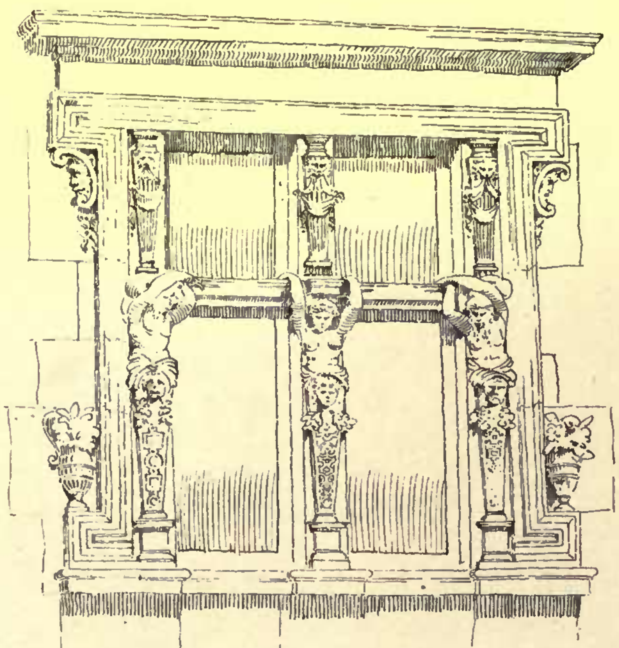
The Cathedral, Toulouse, France.

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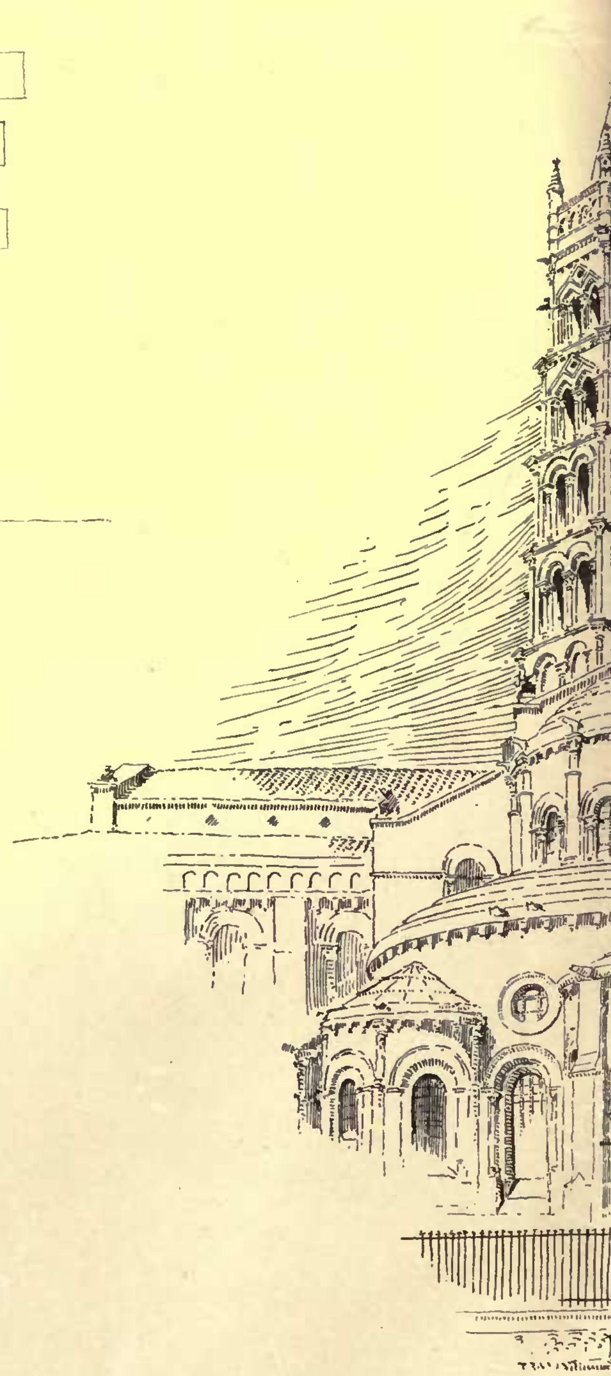
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Renaissance Portal.

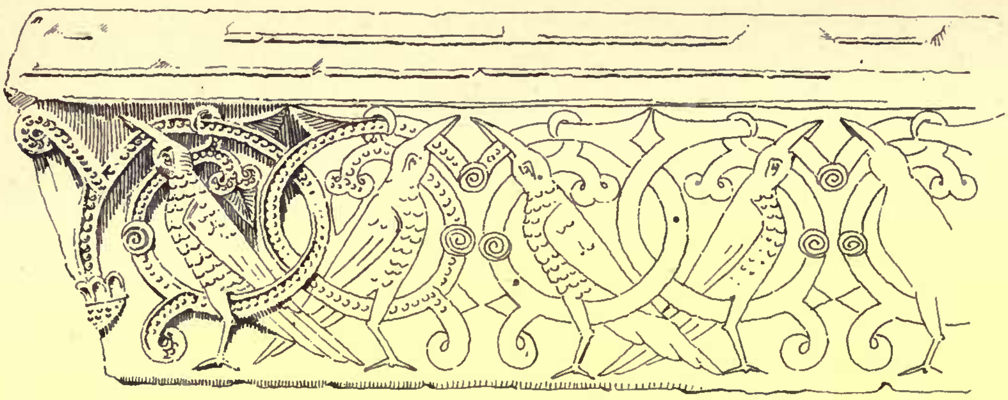


Hotel Lasbordes.



HES

FROM



In the Museum.

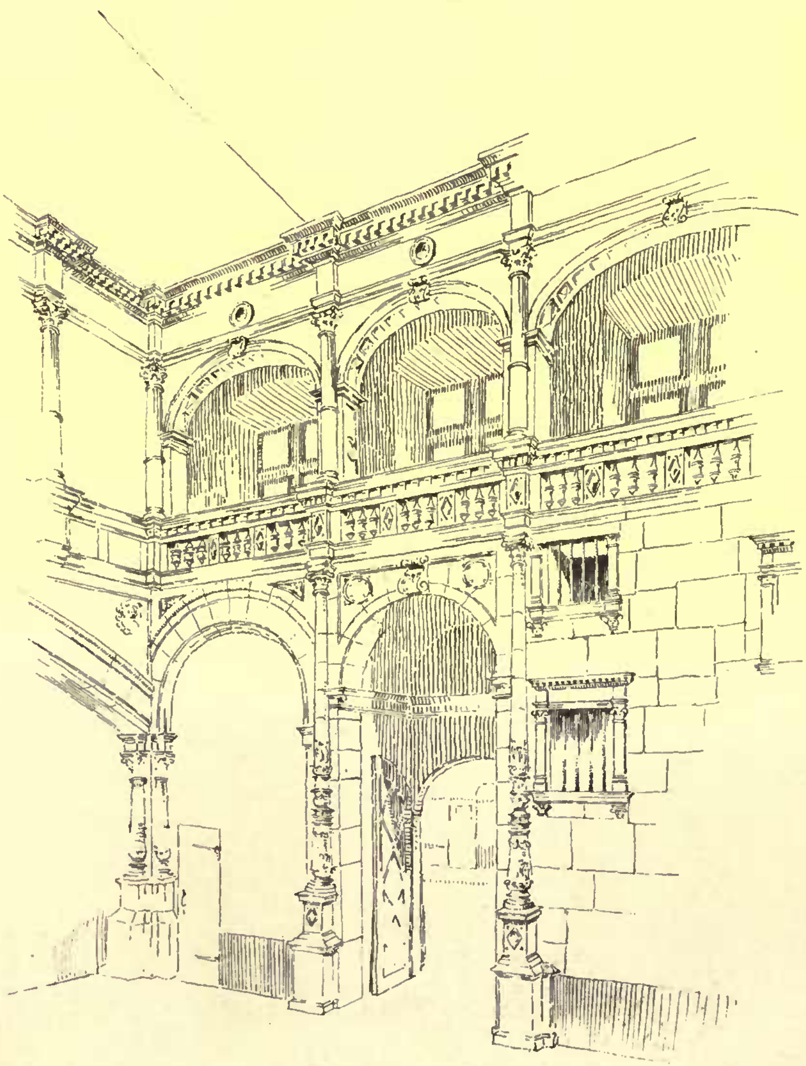
TOULOUSE ~

FRANCE.

By C.H. Blackall.



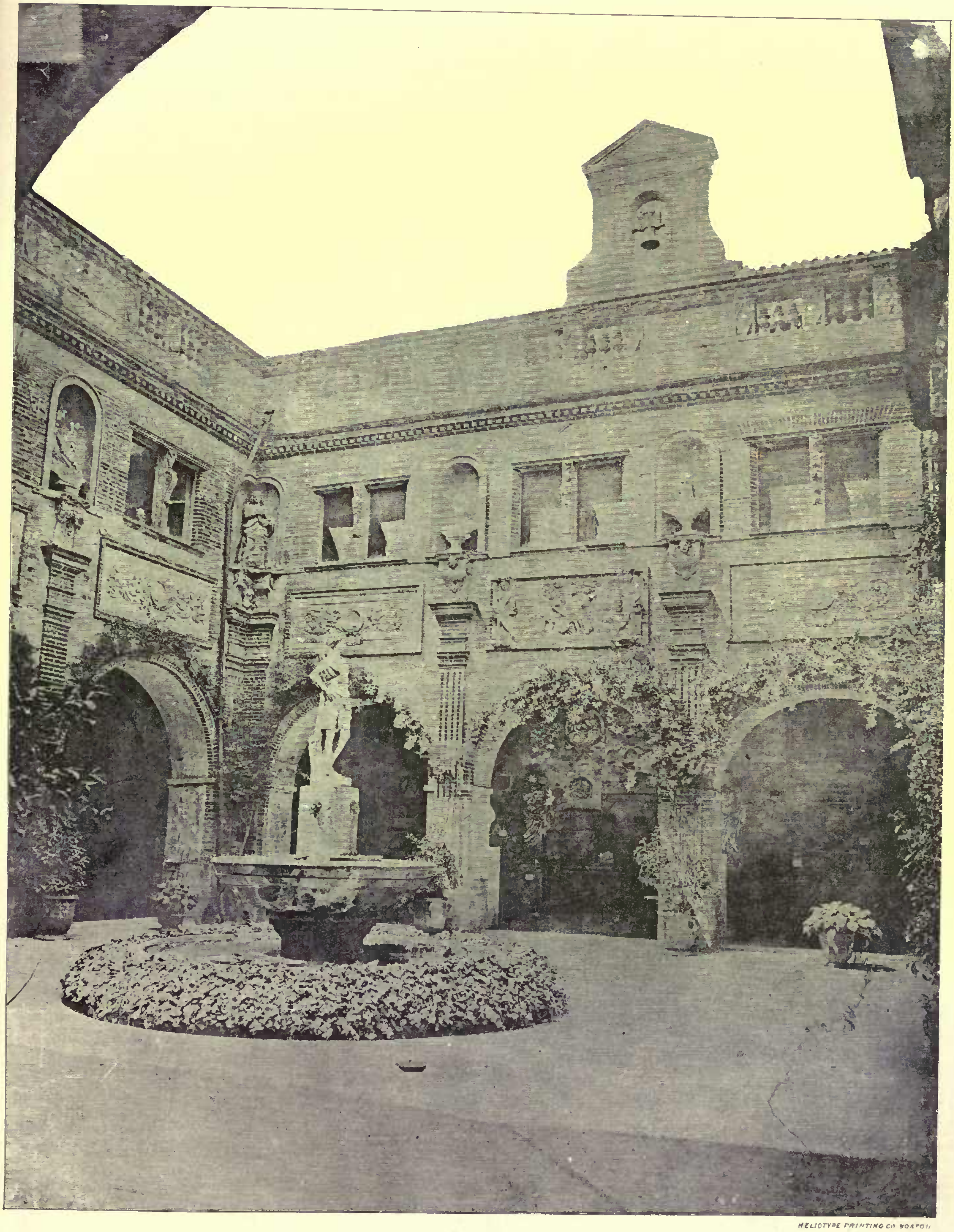
Apsis of St. Sernin.



Courtyard of the Lycée.

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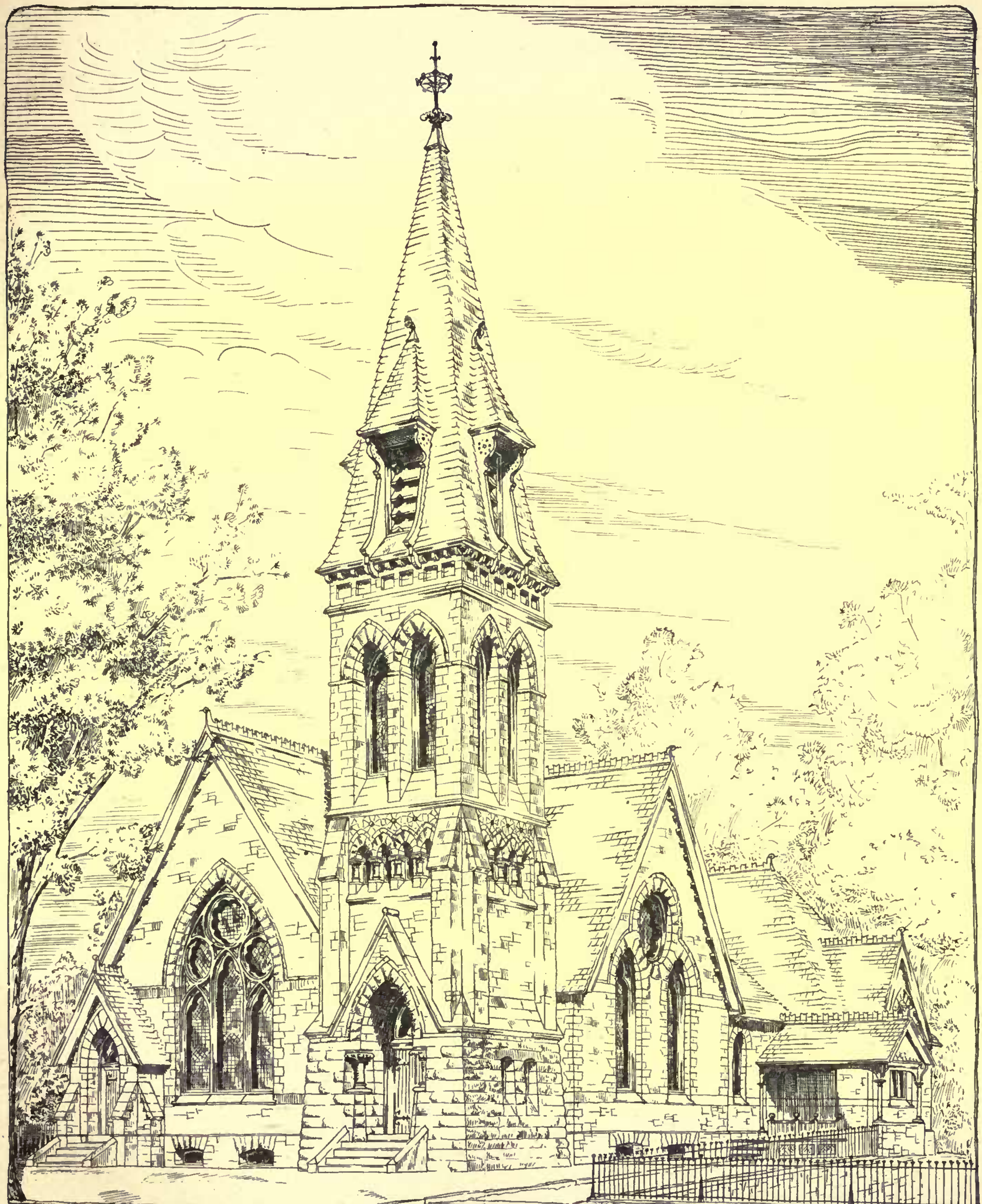
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Court-Yard of the Museum, Toulouse, France.

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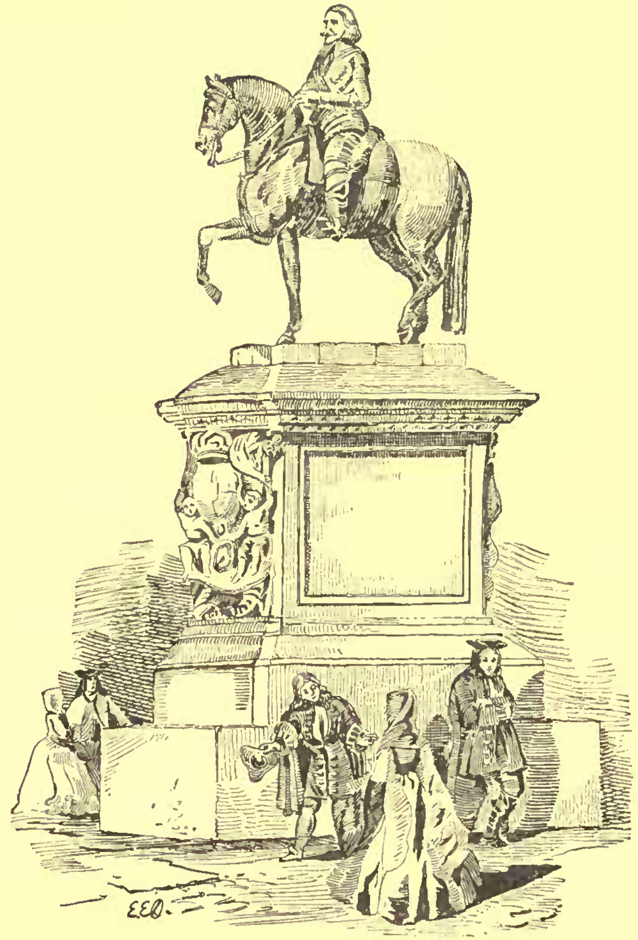


PRESBYTERIAN CHURCH, MT. HOLLY. N.J. PURSELL AND FRY. ARCH'TS. PHIL'A. PA.

HELIOTYPE PRINTING CO. BOSTON



COMPETITION FOR EQUESTRIAN STATUES FOR BLACKFRIARS BRIDGE. LONDON. DESIGN BY R. BELT, SCULPTOR.



Charles I, Charing Cross, 1633. Hubert le Sueur, Sculptor. Pedestal by Grinling Gibbons.



COMPETITION FOR EQUESTRIAN STATUES FOR BLACKFRIARS BRIDGE, LONDON. DESIGN BY HAMO THORNYCROFT. A.R.A. SCULPTOR.



COMPETITION FOR EQUESTRIAN STATUES FOR BLACKFRIARS BRIDGE. LONDON. DESIGN BY C. B. BIRCH A.R.A. SCULPTOR



COMPETITION FOR EQUESTRIAN STATUES FOR BLACKFRIARS BRIDGE, LONDON. DESIGN BY G. G. ADAMS. SCULPTOR.

EQUESTRIAN STATUES, LONDON.

for my money was all gone; so, sad and dispirited, and with a burning sense of injustice, I went away from the stamp office too proud to ask a favor that was undeniably my right." Mr. Bessemer, however, was not entirely discouraged, but went on and made a very important invention in the manufacture of what is known as gold paint or Bessemer bronze.

The circumstances which led to the invention which has chiefly contributed to the fame of Bessemer are graphically described. He had invented an improvement in ordnance and projectiles, and about the time of the Crimean War endeavored to induce the English Government to give it a trial; but the obstacles thrown in his way disheartened him, and he went to Paris, where at a dinner he met Prince Napoleon. The Prince, on inquiry about the invention, became very much interested in it, and asked Mr. Bessemer to show it and explain its merits to the emperor, which he did soon after. The emperor urged him to continue his experiments, and at the same time he placed in his hand a sum of money to defray the cost of them. Some time after, when Mr. Bessemer had built a gun, and with his improved projectiles proved to the French military authorities the value of the invention, a general who witnessed the trial said, "Yes, the shot rotate properly, but if you cannot get stronger metal to make your guns of, the shot will be of little use." It was this incidental remark made by a French officer that first turned the thoughts of Mr. Bessemer into that channel, the following of which has produced the most marked change in metallurgy that the world has ever witnessed. Mr. Bessemer immediately returned to England, made a tour of the principal iron-works, and began a study into the processes by which iron and steel were produced. He than began to experiment in a small way, seeking to improve iron in various ways; but without much success; he built up one furnace after another, only to tear them down again. This continued for a year or two until at last the idea came to him to try to purify iron by blowing through it while melted. He first began by melting eight or ten pounds in a crucible, and blowing air through it by means of a movable blow-pipe. He found that he could make good iron, but that was all; but it encouraged him to go on. He then built a small furnace or cupola, which was open at the top, and had a number of small holes through the bottom, through which he was to blow the air. He had it heated up and hung over it by a chain a round lid such as is used to cover holes in the sidewalks. When all was ready, he told his workmen to pour the melted iron into the top of the furnace and onto the air, and then to drop the lid over the opening. The men turned the metal in but when it struck the air that was rushing in at the bottom, it produced such a frightful roar and so filled the whole place with flames and sparks, that the men fled to save their lives. As the air-cock was close to the furnace no one could get near enough to it to shut it off, and so it roared and blazed away undisturbed. Soon the lid that hung over the mouth got hot, and melting away, dropped down into the fiery mass. As they looked on in amazement they observed a change in the color and in the fierceness of the flames, until in a short time it died down so that they were able to get close enough to shut off the blast and stop the process. When the furnace had cooled down, they examined the metal, without having the slightest idea of there being anything peculiar about it, but a close scrutiny revealed the fact that it was not iron—it was steel. Thus all at once, by what had seemed to be a most undesirable accident, there leaped into existence the most wonderful transformation of metals the world had ever seen or known, and had the wildest dreams of the most studious alchemist of the oldest time come to pass, it could not have equalled what Henry Bessemer had accomplished that day in the old house in which Richard Baxter once lived and wrote. While Bessemer had, as it were by accident, made steel by blowing air through melted cast-iron, he was a long way from having made it in an engineering or a commercial success, and he travelled a long and rugged path ere that was accomplished. That at last it was so made is in part due to the skill and ingenuity of an American engineer, Alexander L. Holly. This in brief is the story of Henry Bessemer and of his first experiment in converting iron into steel. By subsequent changes and improvements it has grown up to be a process not only of great interest but of great importance as well.

In various parts of our country have been built up vast steel-works where by the introduction of air beneath a body of from six to ten tons of molten iron, blown at a pressure that will not permit the fluid n e al to fall into the open holes in the bottom of the converter, in the short space of from twelve to fifteen minutes the entire mass is changed from crude cast-iron to steel. From a recent report of a Bessemer steel plant I find that in twenty-four hours they made 90 heats in their converters, aggregating a total of 883 tons, and during the same time they rolled, 2,597 steel rails, weighing 856 tons. Compare this with the old-time method, where a group of Hindoos with their pig-skin bellows and bamboo reeds worked all day long to fuse a little lump of ore into a pasty mass, which they afterward melted in a clay pot, and then hammered into a knife blade. No wonder the world moved slow in those far-off days, when iron and steel were so hard to get, and no wonder it moves fast now that both are so abundant. The Bessemer steel-works, all of which have been built within but a few years, have now a combined capacity that has yielded steel enough to cover all civilized lands with a net-work of railroads; has laid numerous cables under almost every sea; has filled the air with iron and steel pathways, over which lightning harnessed to thought has made distant lands our neighbors.

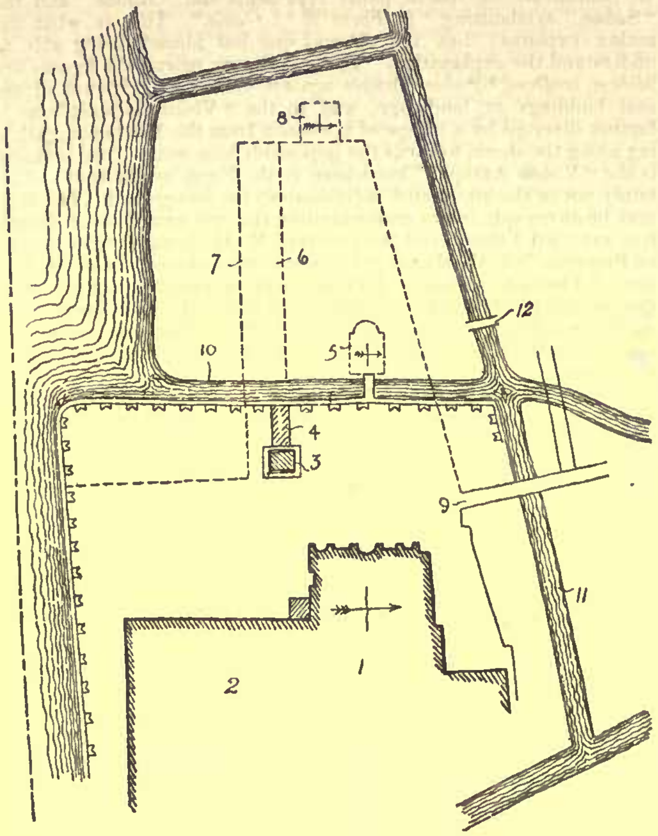
In 1728, John Page patented a process in England, in which he mixed certain vegetable and mineral substances with melted cast-iron, and then directed a blast of air down on it to refine or decarbonize it. Thus more than one hundred years before Bessemer he paved the way for that wonderful process which has done so much for the world to-day. In 1761, John Wood patented a process of melting cast-iron in a furnace and then mixing wrought-iron scrap with it, a process which one hundred years later became an established industry, now so well known as the Siemens-Martin steel. In 1771, the word steel is first mentioned in connection with an application for a patent, and just one hundred years ago Henry Cort, of England, obtained a patent for converting cast-iron into wrought-iron by means of a process since known as puddling, which consisted in melting the pig-iron in a bath of cinder, and stirring it with a bar until the silicon, carbon, sulphur, phosphorus and other impurities are removed, when the pasty mass was hammered down into slabs or billets, and afterwards by means of grooved rolls drawn into bars or rods.

A later and by far more important patent was the one awarded to Henry Bessemer in 1856, and which consisted, as I have told you, in blowing air up and through a mass of melted cast-iron for the purpose of ridding it of its impurities, and thus converting it into steel. Others had previously used steam to bring about the same result, but they found the component parts of steam would not as readily unite with the impurities within the melted iron, and besides, it tended to chill the metal.

Mr. Holloway concluded his address by repeating the following description, written by M. A. L. Holly, of a night-scene in the converter room of a Bessemer steel-works: "The cavernous room is dark, the air is sulphurous, the sounds of suppressed power are melancholy and deep. Half-revealed monsters, with piercing eyes crouch in the corners; spectral shapes ever flit about the wall, and lurid gleams of light anon flash in your face as some remorseless monster opens its red-hot jaws for its iron rations. The melter thrusts a spear between the joints of its armor, and a glistening yellow stream spurts out a moment, and then all is dark once more. Again and again he stabs it, till six tons of its hot and smoking blood fills a great caldron to the brim. Then the foreman shouts to a thirty-foot giant in the corner, who thenceforth stretches out his iron arm, and gently lifts the caldron away into the air and turns out the blood in a hissing, sparkling stream, which dives into the white-hot jaws of another monster — a monster as big as an elephant, with a head like a toad and a scaly hide. The foreman shouts again, at which up rises the monster on its haunches, growling and snorting with sparks and flame. What a conflict of elements is going on in that vast laboratory, a million balls of melted iron tearing away from the liquid mass, surging from side to side, and plunging down again only to be blown out, more hot and angry than before; column upon column of air squeezed solid like rods of glass by the power of five hundred horses, piercing and shattering the iron at every point, chasing it up and down, robbing it of its treasures only to be decomposed and hurled into the night in roaring blaze. As the combustion goes on, the surging mass grows hotter, throwing out splashes of liquid slag, and the discharge from its mouth changes from sparks and streaks of red and yellow gas to thick, full white dazzling flame. But such battles cannot last long. In a quarter of an hour the iron is stripped of its every combustible alloy, and hangs out the white flag. The converter is then turned down on its side, the blast shut off, the recarbonizer run in. Then for a moment the war of the elements rages again; the mass boils and flames with higher intensity, and with a chemical reaction sometimes throwing it violently out of the converters mouth; then all is quiet, and the product is a liquid, milky steel, that pours out into the ladle from under its roof of slag, smooth, shining and almost transparent."

RECLAMATION OF AMERICAN SWAMPS. — The level of some of the large American lakes has risen since the settlement and cultivation of their borders. The rising of Lake Michigan at Chicago is sufficient to be noticeable by those familiar with fixed points along the shore. Salt Lake has risen 2 feet since the Mormons settled in that vicinity, and by irrigation cultivated the land. There are numerous geological evidences that the great Salt Lake once filled a large basin, and the presumption now is that the uniform rainfall induced by the even distribution of water on this cultivated land, has brought about the recent rise of level. At the present time there are two extensive schemes for lowering the surfaces of lakes. The boldest of these projects consists in the drainage of the southern portion of the State of Florida, where the early Spanish explorer vainly sought for the fountain of youth. This region is very nearly level, but slowly rises to an elevation of 60 feet above the sea; it is traversed by small rivers with long names, conferred by the aborigines, but the rank tropical growth impedes their flow. A grant of land has been made to the projectors of the scheme, and a canal dredged from the Gulf of Mexico, and by the flow through this canal, 4,000,000 acres of swamp have been reclaimed, and it is expected that the completion of the work will eventually reclaim 22,000,000 acres. The main canal running across the State will furnish a course by which vessels sailing between ports on the Gulf of Mexico and the Atlantic coast, will reduce their voyage 250 miles. A similar work is in course in California, and contemplates the lowering of Lake Tulane 15 feet by means of a canal 40 miles long, thereby reclaiming 375,000 acres, while water will be used to irrigate and render fit for cultivation 400,000 acres of land. The canal will discharge into the San Joaquin river at the head of navigation, and it will thereby increase the dep.h and make the river suitable for heavier shipping.—*Engineering.*

THE EXCAVATIONS IN ST. MARK'S PIAZZA, VENICE.



The Piazza of St. Mark before 1176.

PROCESSIONS.

AMONG the most noteworthy festivities held annually by the Venetian Republic were the so-called *andate*, or formal processional visits paid by the Doge and the Signoria to various churches and monasteries of the city. On the Feast of the Holy Apostles, one of these processions took place. The Doge, with all the gorgeous paraphernalia appertaining to him as Chief of the Republic, issued from the Ducal Palace. He was preceded by eight standards, by trumpeters with silver trumpets borne on the shoulders of children, by a number of "Commendatori" walking two abreast, in blue robes and red caps, and wearing each a small gold medal with the emblems of St. Mark on it. Then followed a band of fifes and trumpets played by men in red uniforms; afterwards a body of *Scudieri* of the Doge, in black velvet; then the Canons, the *Castaldi* of the Doge, the Secretaries of the Collegio, those of the Pregadi, and of the Council of Ten, and the private Chancellors of the Doge in scarlet robes, followed by the Grand Chancellor of the Republic (*Cancellier Grande*) in a senatorial costume. Then came the chaplain of the Doge, with a boy bearing a candle, and another called the ballot-box boy. After these were borne some symbolical or traditional objects, an arm-chair, a cushion and an umbrella. Next came the Doge himself, wearing the ducal cap and a beautiful short cape or mantle of white ermine, and surrounded by the *Oratori* (ambassadors, etc.) of foreign powers. The best specimens of the ducal cap were to be found in the Renaissance period, when it was made of crimson velvet and surrounded with a golden band set with jewels. Following the Doge came the councillors, the Procurators of St. Mark, the advocates, the chiefs of the Council of Ten, the minister for war, the minister for affairs on the mainland, and then senators and magistrates in due order, all in robes of crimson silk with large sleeves.

The whole procession passed slowly across the Piazza to the Church of S. Geminiano, which occupied a part of that side of the square opposite to S. Mark's, and which was demolished at the commencement of the present century. It was a fair specimen of Renaissance architecture, and was designed by Sansovino.

When the Doge reached the door of the church he was met by the priests in rich vestments, sprinkled with holy water, and incensed; then kissed some sacred relic, and entered the church, where he first kneeled before the altar, and afterwards, occupying his richly decorated seat or throne, heard mass, which was sung by the choir of S. Mark's.

On the conclusion of the mass the Doge returned to the Ducal Palace, but the procession assumed a more ecclesiastical character, being joined by the priests of the Church of S. Geminiano. "When he has reached the centre of the Piazza," says an old historian (Martinioni, in Sansovino's *Venetia descritta* MDCLXIII, p. 497), "on the spot where Narsete had founded his ancient church, and the priest recalling to him what had happened in the past, and the reason why he goes on that day every year to visit his church, reminds him of his duty, and invites him to return next year." At the conclusion of this ceremony the procession passed on its way and entered the palace, where, arrived at the foot of the Giant's Staircase, it divided, and the Doge passing down the centre, ascended the steps with all the Signoria, while the priests with their processional cross retired to the Church of S. Mark. When the Doge arrived in the *loggia* he turned, and the Signoria and Senate passed before him; then, with a salutation, he took leave of them and entered his own private apartments.

S. GEMINIANO.

When the Emperor Justinian determined to undertake a campaign against Totila, king of the Goths, he elected Narsete general-in-chief of his armies, and successor to Belisarius. This Narsete sought the aid of the Venetians — a nation at that time in its youth, but full of promise for the future, brave and experienced in naval warfare, and well acquainted with the lagoons — and promised, in return to build two votive churches on the island of Rialto if he obtained a decisive victory over the Goths.

The Goths were vanquished; Totila and Theja, their kings, were killed; and Narsete, mindful of his promise, about the year 554, built two churches at Rialto, one dedicated to the martyr S. Theodorus, the other to the bishop S. Geminiano and the martyr Menna, of Egypt. The church of S. Theodore was afterwards included in the site of the Basilica of S. Mark, and that of S. Geminiano stood opposite it on the other side of a canal which ran across where is now about the centre of the modern Piazza.

The original Piazza of S. Mark was, therefore, much smaller than the present one, and may be said to have been bounded by the aforesaid canal running about parallel with the Church of S. Mark and the Ducal Palace where there is now the Piazzetta.

As the Venetian Republic grew in wealth and power, towards the middle of the twelfth century the Doge Vital Michiel, or his successor Ziani, determined to enlarge the piazza; and with this object it became necessary to fill up the canal originally bounding it, and to demolish the church of S. Geminiano built by Narsete. This church was soon rebuilt at the end of the new piazza, the ecclesiastical authorities in Rome having protested against the demolition of the old one. The chronicler Caroldo says that the ancient church of S. Geminiano was demolished by the permission of the Pope, but that the Doge was enjoined to go every year on the octave of Easter to visit the new building. According to Sansovino, however, it seems that the Doge was at first excommunicated for the action, but was afterwards absolved on condition that himself and his successors should go every year in penance to the new church. There is another and curious account of the same circumstances which declares that on the Doge applying to the Pope for permission to pull down the church of S. Geminiano, he got the answer: —

"You know that the Roman See cannot allow sins to be committed, but when they are done it pardons them." The Doge took the hint, demolished the church, and then asked for forgiveness. At all events all the chroniclers agreed in the accounts of the annual procession or visit of the Doge and Senate to the church of S. Geminiano, as described in the preceding article, and the reason for which now appears clear.

The new church built at the end of the enlarged piazza about the end of the twelfth century was restored in the early Renaissance period by the Doge Loredano, and a little later it was rebuilt by the great architect and sculptor Sansovino, who, at his death, found a resting-place within its walls. The church itself and his tomb alike remained untouched until the beginning of the present century, when, in order to complete the Procuratie at the end of the piazza and to build the new ball-room of the Royal palace, the church of S. Geminiano was finally demolished, and the bones of Sansovino were transferred to the church of S. Maurizio.

THE PIAZZA.

The plan of the modern Piazza is approximately that which it had at the end of the twelfth century, when Doge Ziani filled up the canal Battario, and demolished the Church of S. Geminiano, in order to provide the necessary space for the new Piazza.

The only important alteration since undergone has been on the side of the Procuratie Nuove, which were originally in a line with the Campanile.

With the help of a map we can easily trace the line of the canal Battario, which bounded the primitive Piazza. Facing the Church of S. Mark, and on the opposite side of this canal, stood the Church of S. Geminiano, the precise position and size of which are at present only matters of conjecture; and the red stone which now records its demolition is placed on the side towards the Procuratie Nuove, but is of too modern a date to be relied upon.

A fourteenth-century chronicle in the Marciana Library has preserved to us a plan of Venice which shows some indications of having been taken from one some two hundred years older, before the new Piazza was formed, and before the two columns on the Piazzetta were raised. In this plan the Church of S. Geminiano is represented as standing on the banks of the canal and facing S. Mark's, while the old Piazza is surrounded by a wall with battlements. We have no other record of any kind of fortification around Venice except its natural one, and a wall which, according to a chronicle of the eleventh century, had been built along the Riva about the year 902, as a protection against the Hungarian pirates. A strong enclosure around the island of S. Mark, which contained the Palace, the Archives, and the Treasures of the State, is not by any means an improbability, and its existence has been accepted as a reasonable

conjecture by some old Venetian historians. Nowadays, theorizing dilettanti deny what, in the absence of proofs to the contrary, any one is at liberty to suppose may have existed; and it is to be hoped that, fortunately, the excavations which will probably be soon undertaken may give some information about the existence of anything like a wall enclosing the ancient Piazza.

Another important point in connection with the Church of S. Geminiano has yet to be decided. The Doge Andrea Dandolo, about 1350, wrote in his celebrated *Chronicon* that the original church had been built by Narsete in the sixth century; but there has arisen a confusion between some Greek inhabitants of Venice, named *Narsis* or *Narsu*, and the celebrated general of Justinian, so that while in the chronicle of Altinate the building of S. Geminiano is said to have taken place in the ninth century, yet in another book of the same chronicle the Church of S. Mark is mistaken for the previous one of S. Theodore; and we have many other evidences of the slight importance of the written records which have come down to us, in comparison with those which Doge Dandolo saw, consulted, and even quoted.

Fortunately it may be hoped that, owing to the gradual subsidence of the soil, some portions of the ground plan or foundations of the Church of S. Geminiano may have remained from its demolition in the twelfth century, and these relics, if any are found, will tell us more about the origin and antiquity of the building than any mere hypothesis, however clever and ingenious. — *G. Boni in the Venice News.*

A RUN THROUGH THE *SALON*.



AS usual, the first thing that strikes a foreigner on entering the Salon, is the enormous size of the works. Who can want them, and where do they go to? Formerly many found their way into the churches; but now the subjects generally treated do not allow of this, and even when they do, the reading of a legend or a page in sacred history is of such a peculiarly modern order that they can scarcely be called religious pictures. Whether the exhibition is better or worse this year will depend upon the views of the critic to a great extent; but no one of any catholicity of opinion in art matters will deny the extraordinary originality of much of the work, both in subject and execution. There are the usual horrors, though perhaps in less force than upon some former occasions; there are a large number of strikingly good pictures, and a still larger amount of absolute rubbish. On the other hand, the nudities are below the average of merit, as are also the portraits. Usually the large number of first-rate portraits is a striking feature of any large collection of French pictures, but this year about a dozen is the limit of what may be called first-rate ones. The landscapes are many and very fine. So, too, are the still-life pictures, though here, again, one wonders what can be the future of enormous canvasses filled with flowers, fruit, fish, and *objets de vertu*, somewhat larger than life.

The first picture which strikes one on entering the large square central hall, and by far the grandest work of the exhibition, is M. Benjamin Constant's "Justinian." The emperor is sitting upon a marble seat between two porphyry pillars, which divide the marble wall into three parts. Behind the throne is a niche containing a bronze Victory — a marvel of realistic painting. A ray of sunlight falls over this, near the upper part. Justinian is clad in a robe of violet velvet embroidered with Greek crosses in gold. An under garment is all jewelled, and on his head is a golden diadem, also ornamented with jewels. On two couches on each side of the Emperor sit, on one side three courtiers, on the other three churchmen. These, too, are all clad in the most magnificent raiment, covered with jewels; while in front is the sitting figure of a swarthy scribe reading from a papyrus. The color is fine, and the different hues of the marble perfectly manipulated. And yet all this blaze of marble and of gorgeous stuffs, all this sparkle of gold and of precious stones does not detract in the smallest degree from the force of the figures. There is immense character displayed in the heads and the expressions. M. Constant has another picture "Judith," equally fine, and possessing all the characteristics of the painter.

If the spectator turns round, he beholds the very antipodes of M. Constant in every respect — M. Puvis de Chavannes. The painter tells us that "Le Bois sacré aux Arts et aux Muses" exhibited in 1884 was the "*composition génératrice des deux autres subjects: 'Vision antique' et 'Inspiration Chrétienné,'*" art being comprised under these two terms — one invoking the idea of Form, the other the idea of Sentiment. A fourth panel represents the "Rhone" and the "Saône," symbolizing "*la Force et le Genie.*" This is what the author explains; but I doubt any one but himself being able to understand the explanation. To the ordinary mortal the figures are lifeless, soulless, boneless shades against unreal backgrounds of unreal buildings or landscape, and in the "Vision antique," one is further diverted by a troupe of horsemen from the Parthenon, galloping along the shore, towards the impossibly blue sea. This, perhaps, is the "Vision Antique," but where is the Form symbolized? Certainly not in the attenuated individuals in the foreground. The fault may be on my side in not understanding the true principles of decorative art; but I should call the panels of M. Montenard, "Sur la côte, en Provence," of M. Michel, "Les soins domestiques," or of M. Cesbron, "Fleurs du sommeil," far more truly decorative. At all events they would be pleasanter companions to live with. The latter is exquisite in refined shades of mauve and blue. Two wonderful landscapes by M. Normann, of Norwegian scenery, hang near M. de Chavannes.

One of the new phases of French art seems to be the fascination of scenes of misery and want. M. Perrandeau's "Misère" is a not too disagreeable example of this school, and is well studied and worked out. On the other hand, M. Geoffrey's "Les affamés" is repulsive in its hideous truth. The selfishness, the eager hunger expressed on the men's faces, as they look at two starving children without sharing their food with them, is true to the life; but it is a side of life that it can serve no purpose to paint. There is no need to depict the brutality of poor human nature; it is rampant enough in the flesh. The same remarks apply to the numberless pictures of drunken husbands and long-suffering wives and children deprived of the necessaries of life — pictures, in themselves well drawn and painted, which are repulsive to all persons of refined feeling, and which point their moral in a doubtful and undecided fashion.

Another curious craze of the younger school is the high horizon. Whether in landscape or figure pictures, the main object seems to be to place it as near the frame as possible, in opposition to all preconceived rules of composition, and to the detriment of many an otherwise good picture. M. Roll is one of the fathers of this new idea. In his "Portrait de Damoye, paysagiste," the horizon is on a level with the man's shoulders: consequently the feet of the figures in the background are as high as the *paysagiste's* elbow, and the ground stands upright as a wall. Mr. Pierce sins in the same way in his "Bergère," a picture full of tender coloring and true sentiment.

Mr. Ralli's "Refectoire dans un convent Grec" deserves notice as being truthful and not eccentric. M. Raffaëlli, on the other hand, is eccentric and not too truthful; but he is original, which is something. M. Vayson's "Chercheurs de truffes" is most clever and charming in color; one scarcely knows which to admire most, the attitude of the old man or that of the black and tawny old sow.

At the head of still life stands M. Vollon, with his red pot, pipkin and oil flask, but the number of excellent pictures in this division is extraordinary. M. Bail's study of objects from the Cluny museum — the repoussé gold altar, silver cross and censers is only one of many.

A group of Flemings, Norwegians, Swedes and Dutchmen ought to be noticed for their originality and purity of coloring, if their subjects are wanting somewhat in the refinement which seems only natural to the more southern nations. M. Vos's "Refectoire des femmes à l'hospice des Vieillards, à Bruxelles," and M. Melcher's "Le prêche à Stockholm" are both charmingly quaint. M. Larsson's "En Suede," an enthusiastic artist done up in furs, painting a snowed-up farm, is very truthful. So, too, are the sunny landscapes, or rather farm-scapes of M. Gagliardini. M. Dagnan-Bouveret's "Pain benit," as a study of expression and color, is masterly; the arrangement of the figures is not graceful.

Amongst the portraitists, M. Lefebvre is, as he always was, careful studied, refined, but over-labored. MM. Aimé and Marot also have good portraits, and M. Fautin must not be forgotten. But at the head of all (and a long way ahead, too) is M. E. Delaunay. His "Mme. . . . " is as masterly as an old master, and the treatment of his tones of black superb. Note, too, the beauty of the foreshortened and gloved arm and hand. M. Paul Dubois has never done anything better than his small portrait.

The landscapes are difficult to remember, there are so many excellent ones. M. Hagborg's soft gray sea and sky is only spoiled by the high horizon and expanse of sand. Mr. Pierce errs in the same way, in his "Bergère," and does consequently his best to spoil a very good picture. M. Isembert's "Avril in Franche-Comté" is a charming idyl, and all the better for its old-fashioned *low* horizon! It is full of sunlight; indeed, sunlight seems quite the fashion now, where formerly gray-day landscapes abounded. It is curious to watch fashion in art. This year miracles and tortures seem to prevail as subjects for the dramatic painters, and swine of various kinds reign among the animalists. Last year mice were the favorites, and a few years ago it was all cats. Talking of animals, I cannot pass by M. Muraton's knowing little fox-terrier, looking out of its faded blue house door.

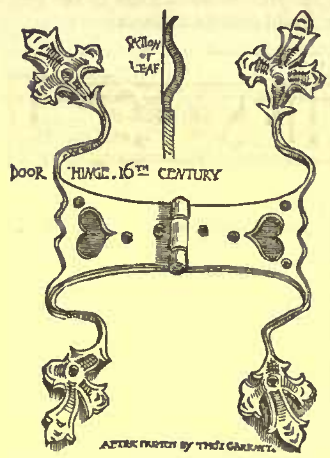
Two more Americans who ought to be noticed are Mr. Walter Gay and Mr. Thompson; also Mr. Sargent, and still more, Mr. Denman, whose "Trio," though somewhat too much an echo of his master, is very fine in its arrangement of reds. M. Henner's "Orpheline" is as fine as his "Fabiola" of last year—always the same, and yet always fresh; one never tires of this master's work.

This is only the first impression of an exhibition of some three

thousand or more pictures. As to the failures, they are many, and those of the older men are sad; but it is no use pointing out the defects of those whose strength is failing them. The faults of good servants in their old age should be passed over in silence.

S. Beale.

THE HISTORY OF TRADES UNIONS.



TRADES unions are somewhere said to be a natural outgrowth of natural laws. However this may be, all such organizations have been, until a very recent period, plants of very slow growth. As long ago as the time of the first Edward, English peasants sought by united action to alleviate in some particulars the hardships of their lot, but their efforts, being generally directed to the redress of special grievances, ceased when success, and more frequently failure was attained. It was not until the beginning of the eighteenth century that trades unions began to be organized for mutual aid and protection and to be permanent. The Watch-makers' Society in London was one of a few existing in 1703, but they were all equally illegal and abhorent to the sentiment of the ruling classes, their members having no power or influence in the State. Hampered by such conditions, little good was immediately accomplished, nearly every attempt, no matter in what direction, being a crime.

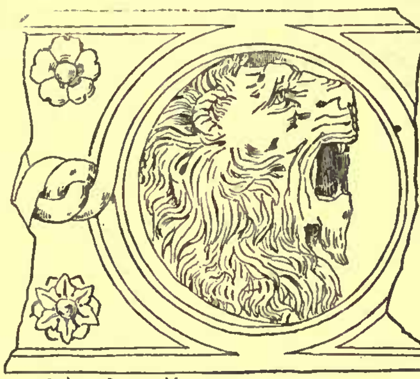
Still these associations increased in number and importance though the ban of illegality was not removed, the Friendly Society of Iron Founders, as late as 1810, being obliged to meet in dark nights on the wastes and moors in the highlands of the English midland countries, and to keep their archives buried in the peat. In those days strikes, the only remedies known, were generally accompanied by violence, which law undertook to meet with the harshest enactments, it being an offence punishable with death, in 1812, to destroy a loom.

The peace which followed Waterloo, stopping the enormous expenditures of a great war, brought about the inevitable reaction and threw out of work thousands of skilled operatives, reducing them to almost hopeless straits. All sorts of agitations for the relief of labor were conducted and remedies proposed. Naturally, trades unions availed themselves of the situation to procure legislation, placing their organizations on a local and more satisfactory footing. The act of 1824 resulted, which declared combinations of workingmen to be legal, but only for "improving wages and reducing the hours of labor," any combinations under it "in restraint of trade" being criminal, as before. Twenty-two years later, in 1846, an indictment fifty-seven yards long was found against a large number of persons for conspiracy in getting up a strike, which rang the changes on all known or imaginable means relied upon to bring it about, and which resulted in very many convictions. It was decided in 1867 that trades unions having rules relating to strikes could hold no property even for benevolent or charitable purposes. This being unsatisfactory, a royal commission was appointed shortly after the Sheffield outrages to examine generally into labor troubles, and among the results of its investigation were the act of 1871, declaring trades unions legal organizations, and, what was all-important, that the members thereof were not liable to indictment for conspiracy. Up to fifteen years ago, therefore, it was a criminal offence in Great Britain for workingmen to unite together for peaceable action in furtherance of a strike.

All legal barriers now being removed, a rapid and marvelous increase in the organization, influence and resources of labor began, so that any statistics a few years old are a long way behind existing facts. At the general conference of 1883 there were one hundred and seventy-three delegates from one hundred and thirty-five bodies, representing 561,091 unionists. The five largest unions doubled in the sixteen years previous, and so rapid has been the increase since, that the number now in the United Kingdom is supposed to be 1,000,000. Their funds, in spite of heavy losses from strikes, are constantly increasing. The cash balance of the five largest unions — engineers, iron founders, carpenters, tailors and stone-masons — was, in 1882, £360,000, and their income for the same year was £330,000. The seven largest societies expended in 1881, for sickness, death, superannuations, accidents, funerals, etc., £220,095. Labor organizations in the United States and Canada have had very much the same history for the same period of time as their British brethren, though there never has been the same legal hostility. Such was the construction of the law in several States, however, that it was thought advisable to procure statutes declaring that combinations to encourage strikes were not criminal conspiracies, provided the particular act complained of, if done by one person, was not a crime. Laws of this character were passed in Maryland in 1884, New Jersey in 1883, and New York in 1882. Laws expressly authorizing the organization of trades unions were passed in Maryland in 1884, and in Michigan in 1885.

The earliest labor combinations in this country were modelled after those in existence in England. Each trade or craft had its own union and worked independently, not only of the outside world, but of unions of other trades as well. These unions still continue under the name of the Federation of Trades, and a national convention meets every year, composed of delegates from each union. But it was long ago discovered that the general organization was not strong enough for defensive, even without considering the necessity for offensive, operations. In the event of any difficulty with employers it was often found that the union in trouble was left to its own resources without any help from other trades or crafts. The mischief was well understood long before a practical man was found to apply a remedy. The old system was much like that in force under the Articles of Confederation, in which each State heard the suggestions of Congress and then did as it pleased. Evidently a new union was necessary with a central head and well-defined executive powers. Uriah Stephens, a Philadelphia tailor, with six others of like occupation, met at his invitation in 1869 and formulated a plan of thorough union of mechanics, laborers, tradesmen and others of like sympathies in an organization to be known as the Knights of Labor. Originally so quiet a society as to compel its members to keep secret even their membership, it has only been within the last few years that its existence has been admitted, and even now reticence is the rule as to those matters about which the public is most concerned — its strength and pecuniary resources.— *Iron Age.*

AN ARCHITECTURAL EMIGRANT'S EXPERIENCE.



In Doge's Palace. Venice.

THE following portion of a letter received from a former fellow-pupil, who, after serving his articles and spending a year in fruitless search for employment in one of our large provincial towns, went out to Australia a year or two ago, may be of interest to other young men in the anxious state which follows the completion of their pupilage. The writer was a good draughtsman, but had little experience of practical work. In Sydney, where he landed, he had no special influence, but he has done well there.

"To give a full account of my adventures up to date would take more time than I can spare. I got work almost too soon after my arrival; had to start work the third day after landing in the office of ——, C. E., architect, mining engineer, surveyor, etc., at £2 10s. per week. I had very little architectural work, and a good deal of surveying and plotting. I worked up surveying and navigation during the voyage, and found neither of them very tough after a bit. In the beginning of last year I was sent up to the Clarence River with a field party (seven in all, including a Chinese cook), and had about three months of as hard work as anybody could wish for. Up before daylight; breakfast — salt-horse, bread and tea; worked till dinner time — salt-horse, bread and tea; work till dusk, then walk back to camp; then tea, of salt-horse, etc. After work we had about an hour's smoking and yarning, then calculations, plotting, etc., till ten or eleven, p. m. Oh! it *was* nice. After leaving the Clarence River three of us surveyed the B—— coal-mine. This was rather better fun; we began work at nine p. m., and knocked off at five in the morning, leaving all the day to ourselves.

"The architectural work turned out of that office was something fearful to behold; villas of brick, cemented outside, with flat roofs, ornamented with gorgeous cement vases, six feet apart, all round the blocking-course, and festoons of something like sausages all round the front. We never bothered about the details of these grand conceptions — nothing was given but the plans and specifications, all the mouldings, ornament, etc., being left to the contractor's own sweet will. You may guess the pleasing result. I never dreamt to what depths bad work could go until now.

"After a little of this sort of thing I began to bethink me that if duffers like —— could get on, why should not I? This kept working in my head for a while, till at last, after much meditative smoking of the Narghili of Delight (clay pipe and Barrett's twist), I made up my mind to commence 'professional practice' — ahem! So I meandered around, and happened on a noodle who was going to build; immediately fastened on him, and got it to do, chucked up ——, and started! Two young fellows with whom I was acquainted, left the Surveyor General's office and started for themselves as draughtsmen at the time I left ——'s, and I agreed with them that we should take an office between us, which we did. We have two very nice rooms with bath-room attached, in a good central position, for £1 per week. At first I could scarcely realize that I was my own boss. Being very busy about a month after I started, I engaged a draughtsmen *pro tem.* at £2 per week. He was an old fellow, with big whiskers (I regret to say mine are not very flourishing yet), and he looked very

much likelier the boss than I did — in fact, I once or twice caught myself feeling very sneaking and uncomfortable if I happened to be a little late in the morning. However, the poor chap got very drunk one day, so I parted with him and got a small boy to whom I can be condescending.

"I have done all sorts of work since starting; nothing comes amiss. The first house (a small street one) turned out pretty well, and got me two others, which are finished, then alterations and additions to a hotel, which is nearly finished. Besides the above I have had lots of little things, bits of surveying, levelling, drawing surveyors' and mining engineers' plans, painting what are called tracing boards for the masonic lodge to which I belong, etc. If I get all the work which has been promised me I shall do well."— *W. B. in the British Architect.*

BOOKS AND PAPERS

IT does one good to go over now and then one's constructional primer, as it were, as almost always it leads to the discovery that, little by little, one has fallen into the trick of doing certain things in certain ways, and not only this — in which there is no harm — but has unconsciously treated analogous things in the same way, and has, unconsciously still, made the scope of the analogy cover a too wide range of operations — all to be done in one and the same way. A deadening process this, smothering the inventive faculties and preventing the exercise of common-sense and the growth of progressive ideas, the result of experience. So it does one good to turn to one's primer again, not necessarily the original primer of one's 'prentice days, but the one last published, with all the newest pictures, the plainest type, the most common-sense arrangement, and the latest methods.

Such a primer is this,[1] which satisfies these requirements in every particular, and is, as a mere specimen of book-making, one of the things that give one pleasure merely to possess. The facts that Col. Seddon is one of the examiners in building construction for the Science and Art Department at South Kensington, that the publishers are the same, and that the books are similar in make-up and general appearance, make us conjecture that Col. Seddon had a hand in preparing those three excellent hand-books "*Notes on Building Construction*," published some ten years ago. There is the same simplicity and directness of statement and explanation that will make this new book almost as useful as are the older ones, in spite of their shortcomings as being adapted to English and not American practice. There is more in this book to irritate the American than there usually is in English books of the kind, because of the frequent reference to patented materials and articles, to say nothing of the price-lists and handbooks quoted. These only add to its value at home, while they are simply annoying to a foreigner. Still one finds plenty to pay for the time spent in looking over the book, and though he wonders at the narrowness which imagines that it is worth while to devote eight lines to a paragraph on "bows to keys," which explains that keys for the War Department must have solid bows, with "W. D." stamped upon them, and the carelessness which simply says that the use of "mastic" has given way in favor of Portland cement, but does not say what mastic is or how it may be applied, he finds many curious and interesting facts. In the former class may be enumerated the curious similarity of two words, neither of which has a familiar air to us: "depeter" and "depretor" mean, the last a plaster surface finished in imitation of tooled stone, while the first may find a footing in our own vocabulary, since it appears to be the technical name for an operation which is just now in favor here. To depeter — it seems as if the word might be used as a verb — is to press into a fresh coating of rough-cast, by means of a board, pebbles of different color so as to form set patterns or an effect of general ruggedness.

Among the interesting facts is a statement that it has been shown by Kirkaldy's experiments that the spalling of cut-stone work may be more certainly prevented by bedding the stones upon thin pieces of pine, instead of eight-pound lead as used to be the custom. Experiment has proved that lead does not, as it was supposed to, accommodate itself to the irregularities of the bed, while the pine does. Mortar joints properly made are, however, safe enough. Another fact is that unprotected iron should not be brought into contact with unseasoned oak, as the gallic acid in the wood quickly destroys the metal.

Among the ingenious devices shown is one by which, in the case of hollow outside walls, dampness is prevented from penetrating to the inner face, as it sometimes does, by means of the bond bricks. This if accomplished by using what is evidently a patented bonding brick, itself pierced with several air-spaces running at right-angles to the thickness of the wall, and moulded to such a shape that the end which bonds into the outer portion of the wall is one course lower than that which is built into the inner portion; in this way the part of the bond brick in the air-space slopes up hill.

Among the many excellent hints is one which might be taken to heart by inspectors of buildings and the framers of building laws in this country. Col. Seddon suggests that it is advisable in works of importance that a specimen of the masonry to be required of the masons should be built on the site, for their guidance, and as an aid in preventing possible disputes as to the quality of the work contracted for; and as he is careful to say that the sample should not be a specimen of *perfect*, but simply of fair average work, we do not see why the suggestion could not be adopted to advantage in the less important works which our domestic Buddensieks undertake.

[1] "*Builders' Work and the Building Trades.*" By Col. H. C. Seddon, R. E., Superintending Engineer H. M. Dock Yard, Portsmouth; Examiner in Building Construction, Science and Art Department, South Kensington; Assistant Examiner H. M. Civil Service Commissioners; Late Instructor in Construction, School of Military Engineering, Chatham. With illustrations. Rivingtons: London, 1886. Price, $4.00.

SOCIETIES

THE ARCHITECTURAL LEAGUE OF NEW YORK.

THE League will make an excursion to Albany, leaving New York by night boat (People's Line) from Pier 41, foot of Canal Street, at six o'clock, on Friday, July 9. Saturday, July 10, will be spent in Albany, and the party will leave Albany by night boat in the evening.

Commissioner Perry has kindly consented to meet the members of the League and conduct them over the Capitol Building. The City Hall, the old Van Rensselaer and Livingston mansions and other points of interest will also be visited.

Architects not members of the League are cordially invited to join in this excursion. The cost of the trip will be $4.50, exclusive of meals.

Those who desire to join this excursion are requested to send their names *at once* to any member of the undersigned committee. The committee earnestly requests that there be no delay in sending in names, as they need to know how many are likely to participate before making final arrangements.

F. A. WRIGHT, 149 Broadway. JAS. D. HUNTER, JR., 57 Broadway.
H. LANGFORD WARREN, Chairman, 96 Fulton Street.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

DOES THE PROPERTY-RIGHT IN A DESIGN VEST IN ARCHITECT OR CLIENT?

June 5, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — I wish to ask you regarding the professional position of an architect, and what is just toward an owner in the matter of property-right in a design which has been furnished and built for him. Some years ago I heard of a case where the owner of one of the most expensive and artistic dwellings at Elberon, N. J., felt that he had been wronged, and was quite indignant that his architects had (as he claimed) repeated themselves in another house, a few miles distant, which they had designed. These architects are of the highest standing, are noted for their ability and originality, and I am sure many would exonerate them wholly from the charge. It was simply an approach to similarity in one or two features, and the general spirit of the one building which suggested the other that occasioned the anger of the client. While a circumstance like this, may be salutary to spur up architects and make them study harder, may I ask has any one in your opinion a right to expect of his architect that in his future practice no design he may carry out shall suggest or even remotely copy what he has done before. I have had in my own experience a somewhat similar case, and it will illustrate my question. I enclose to you photographs of the two houses both built in New York. The requirements of my client in the one case were very similar to those of the other—a corner plot, a stable at the rear, and lawn at one side of the house, a central entrance with porch filling out the front corner of building, and a covered balcony above the entrance. When my second client came bringing me rough outlines of what he wanted with data so similar to what I had had before, I did my best to produce an exterior as different as possible from my first building; with what measure of success as is shown by the photographs. Kindly let me know what would be your verdict. Has the owner of House No. 1 any right to feel that I have wronged him, or have done a thing that should be a damage to my reputation as a conscientious architect, because to meet the special wants of another client, I designed and built House No. 2?

Yours truly, SUBSCRIBER.

[EXCEPT that the point raised is an interesting one, it would be enough to say that in our opinion Client No. 1 has not the slightest excuse for feeling aggrieved. To be sure, the second house does slightly suggest the design of the first one, as could hardly be helped where the sites were similar, and the instructions of the two clients were so much alike that doors and windows must come in about the same places: but one building is of brick, the other of stone; one is three-stories high the other only two; while

as for styles one suggests Queen Anne, the other Queen Elizabeth. With the exception of the porches there are no features which could be called identical. So much for the concrete case. The abstract question of an architect's right to repeat a design is analogous at once to the right of an artist to sell a *replica* of a picture or a statue, and to the right of an author to make use of a plot identical with that in some book of his the copyright to which has passed to his publisher. Professional usage prevents artists from selling copies of works already sold, and in the few cases where copies are made, usually for museums, the consent of the original purchaser is first obtained. As to the author, we do not believe a publisher could prevent him from using the same plot over and over again, if he thought his reputation would stand it: different names and different settings would be enough to make it a different book and subject to a new copyright. We think there may be an impression that because professional usage reserves to the architect the possession of the drawings, it also asserts his right to the design indicated by those drawings; but it is not for the purpose of enabling architects to reproduce bald copies of their designs that this custom has been established; and we think it extremely doubtful whether an architect could maintain his right to repeat a design already executed for a client. On the other hand, we feel sure that the client could only prevent his architect from building an *exact* reproduction, line for line. To put our opinion briefly, we think that an architect can maintain his right to what he would call his "idea," while the client can only guard for himself the special embodiment of that "idea" for which he has paid. We do not know that a question of this kind ever got before a court In spite of the instructions an architect sometimes receives from a client who wishes to have a building "just like the one you built for So-and-so." he usually prefers and generally manages to convince his client that he can easily excel his earlier performance, and though what he does may very possibly recall what he has done before, as Sullivan's latest opera recalls his earlier ones, still he cannot be held to have infringed the rights of any of his former clients. — Eds. American Architect.]

VERANDA SCREENS.

Middletown, Conn., June 12, 1886.

To the Editors of the American Architect: —

Dear Sirs, — Can you give me the address of parties who make screens such as are used between posts to verandas on seashore and country cottages? Think they are made of matting, with roll at top, to get them out of the way of the weather. If you can oblige us we shall esteem it a favor. Very truly yours,

J. W. Hubbard & Co.

[Some, at least, of the screens our correspondent refers to are real East Indian "tattas," which have probably been obtained of commission merchants who handle Oriental goods.— Eds. American Architect.]

NOTES AND CLIPPINGS

A Test for Drinking Water.— A simple test for drinking water is recommended by a German physician, Dr. Hager. It consists of a tablespoonful of a clear solution of tannin to be added to a tumblerful of water. If no turbidity occurs within five hours the water may be considered good. If turbidity occurs within the first hour the water is unwholesome. If turbidity is displayed within the second hour the water is not to be recommended. Previously, in 1866, Dr. Hager recommended for travelers, as a precaution in cholera times, the addition of the following solution (thirty drops to a liter or quart) to any water they might be about to drink: Tannic acid, 5 parts; sirup, 4 parts; distilled water, 6 parts; spirits of wine, 12½ parts.—*Chicago Daily News.*

Discovery of a Statuette by Zenodorus.— At a recent meeting of the Académie des Inscriptions, Paris, M. Ravaisson announced that the Museum of the Louvre had received the addition of an interesting statuette of Mercury from Entrains, in the department of Nièvre. The statuette is in bronze, of small size, and is considered to be a copy of the colossal statue of Puy de Dome, executed by Zenodorus, under Nero. Zenodorus, it will be remembered, was famous for the fabrication of colossi. The one ordered by the Averni took ten years to make, and cost a sum equivalent to about £335,000. The statue of Nero himself had to be removed by the help of twenty-four elephants. This colossal tendency will scarcely be perceptible in a small copy, but, happily, Zenodorus was equally famous for his toreutic skill.— *N. Y. Evening Post.*

Russian Sheet-iron. — The following method of manufacturing Russian sheet-iron is given in "Calvert's Almanack." Selected iron is hammered into slabs of the right size, and to make a finished sheet the slab is passed through rolls, making 75 to 80 revolutions, three or four times, after which it is hammered again. Several sheets are then heated to a full red heat, covered with charcoal shaken on to them from a bag made of coarse linen, and are then piled with covering sheets of heavier iron top and bottom. The pile is then worked down under a heavy hammer until nearly of the finished size. When cool, the hammering ceases, the plates are separated, reheated, and piled again with cold plates interposed, the hot and cold sheets alternating in the pile. The hammering is then repeated until they are cool, after which they are cut to size.— *Iron.*

The Last of a Pennsylvania Forest. — A recent despatch says that the last merchantable tree in the vast hemlock forests that have supplied the mills on the Dyberry Creek, one of the tributaries of the Laxawaxen river, Pennsylvania, has been cut and was piloted down the river by Bill Kimble, who drove the first log down in 1860. For twenty-five years the axe has been at work in these forests and now the last tree of value is gone, and with it have gone all the tanneries that have enriched their owners. The work of destruction is now going on in the Western counties of Pennsylvania, whose tanning industry now supplies almost the entire sole-leather product of the world. It is also stated that, as usual, the destruction of the forests has been followed by the drying-up of many large streams. The disappearance of the forest primeval from our continent is steadily going on.—*Rochester Herald.*

Plumbing in America — from an English Standpoint.— A London plumber came to the United States some time ago and has recently sent a private letter home. After saying that he had become very low in pocket and spirits, he goes on to say: "Mr. M—— gave me a job, and I stayed with him for about three months fitting up water-closets, etc, in his show-room. He then got me a job out in Orange, N. J., at a large private house, which was fitted up in first-class style. I worked there for about a month, when Mr. M—— was applied to for a man to go to Florida, to work at a large hotel there, and he at once sent for me, and offered me the job, which I accepted; and I may say I never had a better job in my life. I went there and back by boat, cabin passage, my fare allowed both ways, and I averaged $23 per week wages. It was at a place called Winter Park, Orange county, South Florida, and the weather was very beautiful. The only thing I did not like was, that it did not last long enough. The work was just suited for me, being all inside work, and all lead, and plenty of time allowed, so long as it was done well. I got on first-class with the boss plumber, and he has promised me a job, as soon as it is ready, at another hotel in St. Augustine, North Florida, which he has charge of, and which he says will be ready about June. I returned from there on Friday last, after a rough voyage, and found New York frozen up; so I have bought myself a pair of good skates, and intend having a week or two's skating before I start work again. The work here is very good, provided one gets on a good firm, and is also well paid, $3.50 being the daily stipend for plumbers. I think, also, that there is plenty of work about just now, and will be for some time yet, so that I don't think I should ever care about settling down again in England, although it is probable I shall come over in the summer for a visit. I find there has been a great number of English closets used here, but they are universally condemned now, and are taken out and replaced by others, wherever the people can afford it. There are also several large pottery works here, and they claim to be able to turn out quite as good, if not better, earthenware than in England; so that I believe there is but very little sent over here now. This is a great country for plumbing work, and there are also some first-class openings for business; so I think very likely I may start myself, when I get a little more used to it. I have spoken to plumbers here, and told them there are Yankee plumbers in England, but they will scsrcely believe it. They say they must be either bad workmen, or else rogues, and were obliged to quit this country, for they can't understand men working for $10 a week, when here the pay is $21, and many of them $25 and $30 per week." — *Sanitary News.*

A New Safety Cartridge for Coal Mines.— A new safety cartridge for use in mines where it is not safe to blast with gunpowder, has lately been introduced in Germany by Dr. Kosmann of Breslau. Its action depends upon the rapid liberation, in the bore-hole, of a large quantity of hydrogen-gas, the pressure resulting from which forces the coal or rock asunder. The hydrogen is liberated by means of the action of sulphuric acid upon very finely-divided metallic zinc. For this purpose Dr. Kosmann takes the bluish-gray powder which forms in the condensers of zinc distillation furnaces, and which consists of metallic zinc which has not been condensed to the liquid form, but results as a powder, or as a more or less spongy mass. There is a small amount of oxide mixed with it, but for all practical purposes it may be considered as metallic zinc. The cartridge consists of a glass cylinder, narrowing to a neck, and being also contracted at a point below the neck, so that the cylinder is divided into two portions, communicating through a contraction whose opening is 8 mm. to 10 mm. The contraction is so placed that the two parts of the cylinder are to one another in cubic capacity as 1 to 4, the smaller part being near the neck of the cylinder. The lower, or larger division, is filled with sulphuric acid obtained by diluting the chamber acid of commerce with an equal volume of water. The contraction is then closed with a stopper of rubber or cork, and in this condition the cylinder is handed over to the miner. The hole being bored ready in the coal or rock, is well clayed over inside in order to close any cracks or cavities through which gas could escape. The upper part of the glass cylinder is now charged with the zinc powder, and an iron rod is laid in, passing through the zinc and resting upon the stopper in the contracted part of the cylinder. The neck of the cylinder is then tightly plugged with clay, and it is laid in the hole, which is then also well tamped with clay, the iron rod passing through both these clay stoppings, and projecting some little distance beyond. In order to "fire the shot," the miner strikes the iron rod with a hammer so as to drive in the stopper in the contracted part of the cylinder, or to break the glass at that part. In either case the acid at once runs in among the zinc powder and a very rapid evolution of hydrogen takes place. The iron rod is not uniform in thickness, but conical, being thicker towards the outside, and this increase of thickness is considerable, so that when the rod is driven in it keeps tight in the clay stoppings and prevents any escape of gas. The inventor gives figures to show that a cartridge 180 mm. long and 25 mm. in diameter, taking a charge of 50 cubic centimeters of acid and 12 grammes of the zinc powder, will give rise to an evolution of gas equal to 2.37 cubic meters at ordinary barometric pressure; and that the compressure of this volume of gas into a space of 90 cubic centimetres means a pressure exerted on the sides of the hole equal to some 37,000 atmospheres. The pressure is obtained rapidly, but not so rapidly as to in any way endanger the man who drives in the rod. He has plenty of time to get away before any coal or rock comes down. It does not appear that these cartridges have yet had any thorough trial in practice, but much is expected of them, and the making of the cylinders has been intrusted to a large firm who will insure their being good and uniform. The cost of each "shot" will be one penny to three half-pence, according to size of the cylinder and charges used.— *Engineering.*

THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XIX. Copyright, 1886, TICKNOR & COMPANY, Boston, Mass. No. 548.

JUNE 26, 1886.

Entered at the Post-Office at Boston as second-class matter.

CONTENTS

AS one of the most respectable attributes of civilization is a regard for the law, it is not surprising that communities which profess civilization in its highest reaches make law their shibboleth, and defend their claim to be held law-abiding citizens with the utmost vigor. There is something heathenish in this superstitious regard for the law, and at the same time there is a strong dash of the ridiculous in the situation when one hears one of these professors defending a questionable line of action, simply because there is no law against it, as vehemently as he would condemn the course of another professor who had dared to break a recorded law. If the conduct of a community is to be regulated in all things by law, it must have law-makers — and, as a consequence, law-breakers — and we find in the most civilized communities that laws are made with an appalling prodigality. The next step taken is to spend infinite pains in training a large body of men of the keenest intellect, whose ostensible duty it is to interpret this mass of legal fiction which fetters and controls the impulsiveness of the natural man, but whose real occupation and delight it seems to be to show how the mandates of the law may be avoided. If only we could have more equity we could get along with less law, and consequently with fewer law-makers, and having fewer of this ingenious class to provide for and house, we in Boston, who have a sincere regard for the quiet dignity of the State-House which tops Beacon Hill and furnishes the appropriate crowning feature to a whole city in a manner that has but few parallels, would not be pained from time to time by the rumors that our law-makers find themselves so incommodiously housed that a new state-house — capitol is nowadays the word — must be built at once. There is only one thing that could reconcile us to having the work of Charles Bulfinch removed or remodelled, and that is the presence of the new apartment-house at the corner of Joy Street, which has played such cruel havoc with the graceful outline of the chief feature of Boston's landscape. We could wish that in this case some law could have been incubated in time to suppress the exuberant manifestation of the rights of private property by two stories at least. Just now the talk of the necessity of having a new state-house is more persistent than ever, and something will probably have to be done to meet the needs of our permanent and periodic — though at times the two classes threaten to become indistinguishable—public servants. But we think that the citizens of a town where the weight of public opinion has conduced to the preservation of the Old State-House and Old South Church need not entertain a very vivid fear of seeing the structure, which has been for nearly ninety years the city's modest pride and the goal of much bucolic ambition, give way to a "capitol," which, however satisfactory as a matter of grandiose architecture, and however free from the taint of jobbery and corruption, could only be looked on with disapprobation by Bostonians of the two elder generations at least. To destroy the State-House would be to do Boston a greater injury, historically speaking, than would be done by the destruction of Faneuil Hall, for the simple fact that it would modernize the aspect of the entire city at one stroke. Boston feelings, however, are not alone to be considered, and if the citizens of other parts of the State insist on a new or a remodelled structure, we trust that they can be induced to content themselves with extending the building on the northern side.

THE situation is a little more threatening just now than usual, since both branches of the Legislature are in favor of a new building; and the Senate bill, which has been reported on favorably by the House Committee on Finance, grants to the Governor and Council the right to bond land for a suitable site. Governor Robinson is said to be in favor of taking all the land now bounded by Beacon, Joy, Mt. Vernon and Bowdoin Streets, closing up the north-and-south portion of Mt. Vernon Street, and were the city newly laid out the selection would be a natural one enough. But under the circumstances we trust that the Massachusetts Historical Society, the Bostonian Society, and the Boston Society of Architects will be able to show good and sufficient reason wherefore this act of vandalism should not be consummated, the former by proving that the building ought to remain practically untouched, and the latter by showing that there are other architectural solutions of the problem than that which involves the demolition of the present building and the annihilation of all associations connected with it.

THE cosmopolitan composition of our population and of the architectural profession in particular is constantly brought to our attention when we have occasion to look over our list of subscribers, though custom has made certain names so familiar that it is not easy to remember that they are even more common in foreign countries than in this. Teutonic, Gallic and Slavic names are easy enough to identify, but the Anglo-Saxon alien can be identified only by other attributes than the name he bears. It would be interesting to know what causes led each individual to emigrate to this country — not in these days, but years ago, when, from a foreigner's standpoint, there was little in this country to attract, or to promise a successful career in his chosen calling. To escape compulsory military service, to avoid the consequences of engaging in unsuccessful political movements, or to obtain a mere livelihood which was denied through lack of connection or the too crowded condition of the profession, we imagine would account for the presence of many a Continental architect who is now a good citizen of these United States. The presence of the Englishman is more natural, and probably is not so generally a consequence of some interesting or romantic episode; yet the fact that Jacob Wrey Mould, who died in New York, June 14, in his later years chose to join one of the most adventurous of Americans, Henry Meiggs, in his railroad undertakings in Peru, shows that the spirit of enterprise which led him to emigrate to this country in 1853 had endured throughout his life. Mr. Mould was born in 1825, and took his degree at King's College, London, in 1842. In what office he obtained his architectural training we do not know certainly, but his connection with Owen Jones, and his collaboration with him in his well-known work on the Alhambra, leads us to suppose that his training was received in Jones's office; it would at any rate account for the marked predilection he showed in after life for the practice of the decorative branches of the architect's work. Mr. Mould is best known, thanks to the political turmoil that has always been associated with all that concerns the New York Central Park, for his connection with the laying-out of what is now one of the famous urban parks of the world. We cannot imagine that to him is due as much as to Mr. Olmsted, but there was so much to do, and so many possibilities of doing the wrong thing, that we cannot be too grateful that the work fell into hands no less skilled than his. At first only the assistant of Mr. Vaux, he some years later succeeded that gentleman as architect-in-chief to the Park Commissioners, and held the position till he went to Peru. The death of Meiggs, and the consequent collapse of his vast schemes, caused Mr. Mould to return to New York, where he was soon after fortunate enough to resume his old position. Amongst the work outside of Central Park designed by him are All Souls' Church on

Fourth Avenue, his first work in America, and the West Presbyterian Church. His most notable work in the Park is the terrace.

THE burning of the building known as that of the Manufacturers' and Mechanics' Institute, at Boston, on Monday last, has lessons of various kinds to teach, but the one which most impresses itself on our imagination is the possibility of there being at some time an enormous sacrifice of life if fire should break out in an exhibition building while crowded with holiday-makers. The late fire has shown the startling rapidity with which flames spread through such a huge building, even when practically empty, creating its own draughts and currents as it goes; it has shown that even so few as one hundred men, active and familiar with their surroundings, could not all escape with their lives, and it has also shown the utter powerlessness of a skilled fire-department to subdue a fire in so large a single-celled building. We cannot recall that fire has ever attacked an exhibition in full operation: the nearest approach to such a disaster that we can discover is the burning, after its final closing, of the exhibition building and its contents at Port Alegre, in the southern part of Brazil, in the fall of 1881. Intended to be a permanent exhibition building, the Boston structure, which, exhibitions proving unremunerative, in its last estate had become a repair-shop for one of the horse-railroads, was built with care, and was a fairly-substantial brick building, so much so that the Boston *Herald* allows one of its reporters to say that it was "thought to be nearly fire-proof," although he contradicts himself in the next line by showing that for every brick in the building there was a foot of lumber used. The combustion of the wood used in the floors, galleries, partitions and so on of a building four hundred and three feet by five hundred and fifty-one feet would severely test any kind of fire-proof building material, and it was to be expected that the unprotected iron roof-trusses would give way speedily; indeed, it is said that a portion of the roof fell before the first engine reached the spot, and the building was practically beyond salvation within half an hour after the fire broke out. Perhaps the most salutary lesson to be learned is that it is unwise to neglect the counsel of expert advisers. It is said that the railroad company had been advised at the time of their purchase of the building to lessen the fire-risk by building at least three cross-walls, which would confine a fire, should one break out, to the compartment in which it first appeared, and so give the firemen a fair chance to fight it. But even the offer of the insurance companies to make lower rates could not avail against the consideration that fire-walls of such magnitude would cause considerable present expense, while the chance of a conflagration was so remote that it would be a safe risk to gamble on the chance of a fire ever occurring. We presume that Mr. Atkinson could produce evidence to show that the doctrine of chances cannot be applied to combustible buildings of any kind or size, except so far as to prove that because they can burn they probably will burn.

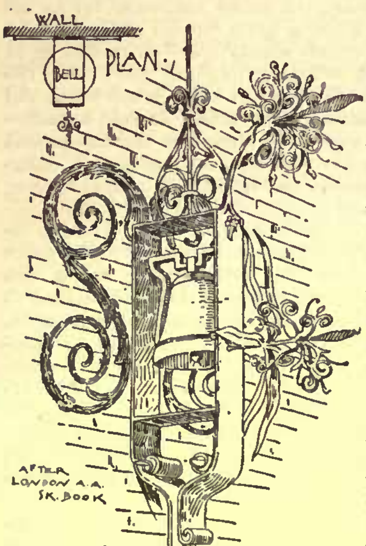
THERE is the maddest kind of a race between the great insurance companies in New York who are striving to outbid one another in the matter of low rates on dwelling-houses and buildings used jointly as stores and dwellings. One case is mentioned in which two hundred thousand dollars were placed recently on nine buildings, at the rate of ten cents on one hundred dollars for three years. An agency that receives forty per cent had the writing of these policies, and deducting this amount, only two cents a year on a hundred dollars was left for the company taking the risk. The statistics for the past four years show that nearly twenty-six thousand dwellings and tenements have been burned, and the loss on this class of risk has been larger than on any other. Competition is undoubtedly the life of trade in fire insurance as in other kinds of business, and house-owners will, of course, be glad to see the reduction of rates carried to the lowest possible figure; but even those who get the benefit of the competition cannot help wondering how far it is possible to go, and how dividends can be paid on a basis that a few years ago would have been considered positively ruinous.

THREE years ago, in discussing the difficulties which the erection of so lofty and peculiarly shaped a structure as the Statue of Liberty would present, we suggested that the necessary stability could be secured by suspending within the body a properly-weighted beam or pendulum, like those used for a similar purpose in Japanese pagodas. We had supposed that so ingenious a people as the Japanese would not employ a device of this kind if it had not proved itself a good and useful one, and as most of the pagodas are built with this huge beam running from the apex of the roof to the ground floor, and as many of them are of great age, it seemed as if the testimony of time favored the adoption of a similar construction where the circumstances were analogous. The discussion of a paper lately read before the Royal Institute of British Architects by Mr. Roger T. Conder indicates, however, that, in spite of the common belief of Japanese carpenters and others supposed to be instructed in such matters, this central post was not used as a pendulum whose vibrations should serve to counteract those of the pagoda, whether occasioned by wind or earthquake. This central post or supposed pendulum, which is invariably found in five-story pagodas and is usually suspended from the apex of the roof, is supposed to be the invention of Hidano Tokuni, who lived in the ninth century and is regarded as the Vitruvius of Japanese architecture, though his precepts were transmitted orally and not in writing, so that there is no authority which can be consulted save the buildings themselves. Careful examinations of these made by Mr. Conder's brother Josiah shows that this central post—some three feet in diameter at the bottom and tapering to the top — while it was usually suspended from the apex of the roof at first, was so carefully proportioned that when the settlement and shrinkage common to new buildings should have ceased, the lower end would rest upon a stone. Mr. Conder believes that the function of this post is only that of any upright which aids in maintaining the stiffness of a structure, and he seems to think that in the few instances where the post actually does not rest upon the stone foundation provided to receive it the explanation is to be found in the fact that the shrinkage and settlement proved to be less than the builder expected when he cut his post. The reason for suspending it from the roof, he thinks, was, that were so long an upright to support the roof from a fixed foundation the shrinkage and settlement in the rest of the building, finding no equivalent in the longitudinal shortening of the post, would seriously deform the building and bring about its speedy decay. It is also thought that the weight of the suspended post was of service in securing an equal settlement of the structure. This view is supported by an extract from an old Chinese book called "*Go-Gasu-So*," which, speaking of the earliest towers, says: "Whenever high pagodas were erected in ancient times, they invariably fell down, and to remedy this falling down some builders hung huge stones inside of them, with strong ropes extending from the apex down to the ground, but not quite touching. This invention was good, and since it was employed no more pagodas fell down." The extract could, however, be quoted with equal propriety in favor of the pendulum theory.

M. RIVOALIN, one of the clever writers on the staff of *La Semaine des Constructeurs*, has an article in a recent number, suggested by a letter from a correspondent, on the dangers of modern roof construction, from which it appears that America is not the only place where buildings fall. We have already had occasion to speak of the prejudice against suspension-bridges which have existed in France since the fall of two bridges of the kind on the Loire, one of which, that at Angers, was brought down, with a battalion of soldiers upon it, by the vibration caused by their regular march; while the other was thrown down by a lightning stroke, which severed one of the cables; but these are by no means the only structures which fall there. Not long ago the iron roof over the market of the Château d'Eau, in Paris, fell in, under a load of snow. The exact cause of this accident was never known. Probably some defect in a tension member or a bolt brought to grief a truss otherwise properly designed and constructed, and there may have been a little truth in the suggestion made by a scientific person at the time, that the contraction of the iron, caused by the melting of the snow upon it, brought strains upon certain members which they were unable to resist. A year ago, however, another roof of the same sort, built over a similar market in the town of Thiers, fell in soon after it was completed, and wounded several persons. In this same town, about four years before, as our readers will remember, the stone staircase of the town-hall fell, killing several people, so that even French masonry, solid as it seems to our eyes, is not entirely free from the defects which afflict our own flimsy work.

AN EDITOR'S TRIP ABROAD. — I.

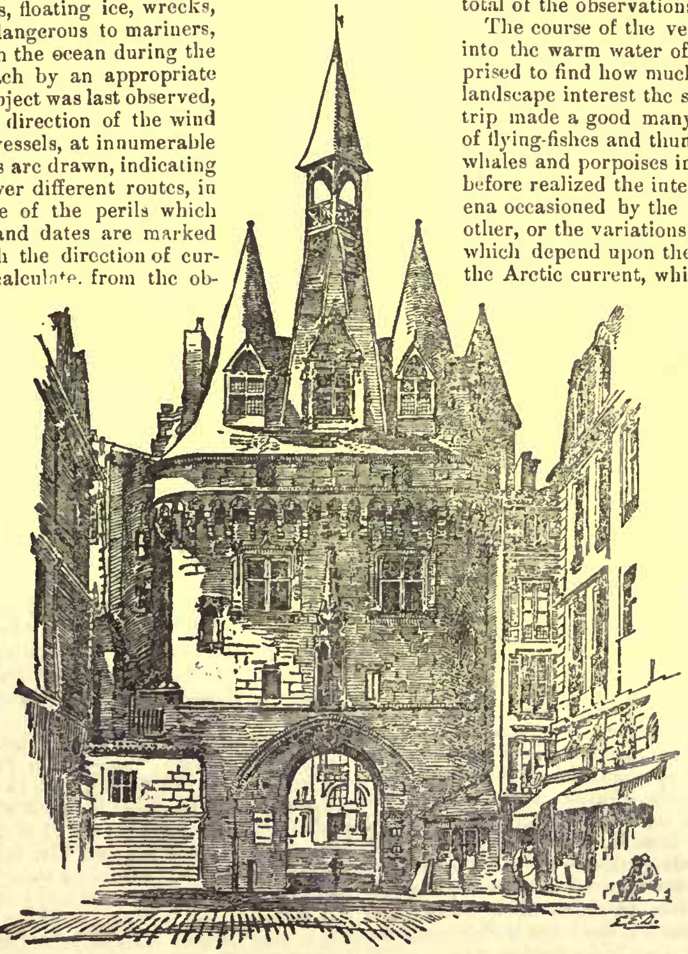
STEAMSHIP CATALONIA, June 5, 1886.



WROT IRON BELL FROM A COURT YARD GERMAN EARLY 18th CENTURY. SOUTH KEN MUSEUM.

IF there is one thing that disconcerts an editor more than another, it is, perhaps, to find out that there was something that he did not know, and this experience has occurred to me during the last few days with such distressing frequency that the suspicion has even arisen at times within my mind that there may yet remain some trifling matters to be discovered.

One of the facts I have now learned, a little too late for my best advantage, is that there exists in the United States an admirable arrangement, by which the intending traveller by sea can provide himself before leaving shore with an appliance for his amusement and instruction which will serve him day after day throughout his voyage, and will remain afterwards a most interesting souvenir of it. This appliance is known as a Pilot Chart, and may be obtained without expense by any citizen intelligent enough to use it, on application at the Hydrographic Office in the Custom-house of the port from which he sails. It seems that the Hydrographic Bureau at Washington, being in the constant receipt of marine intelligence from all parts of the world, collates this once a month in the most useful form, by plotting on charts, at a tolerably large scale, all the icebergs, floating ice, wrecks, derelict vessels and other objects dangerous to mariners, which are known to have existed in the ocean during the four weeks previous, indicating each by an appropriate mark in the position in which the object was last observed, and giving further the prevailing direction of the wind during the month, as reported by vessels, at innumerable points. In addition to all this, lines are drawn, indicating the courses for vessels to follow over different routes, in order to avoid as many as possible of the perils which the chart is designed to show; and dates are marked wherever practicable, together with the direction of currents, so that the navigator can calculate from the observed position of an iceberg, for instance, on a given day in the preceding month, the point at which he would be likely to encounter it in his own track.



Palace Gate, Bordeaux, France.

To the landsman, whose idea, perhaps deduced from the accounts of those voyages which occupy most space in the newspapers, usually is that the steamers' "prow" is first pointed in the right direction, and the vessel then driven ahead until it brings up against something on the other side of the water, the care with which the ocean paths are mapped out on the North Atlantic chart is surprising. In our case, this being the season at which ice begins to invade the direct road between America and England, the "safe course" for the month was deflected far to the southward of the straight line connecting Boston with Queenstown, indicated by an irregular blue mark on the chart, showing the limits within which ice would probably be found, while numerous small outlines in brown ink with dates attached, showed the exact positions of the icebergs reported as floating within the ice-invested region. The Cunard Company probably takes no risks that can be avoided, and, in accordance with the indications of the chart, the steamer, instead of following the direct, and, as most people imagine, the usual course to England, by way of Cape Sable and the Banks, sailed southeasterly for a thousand miles, into a latitude little above that of Philadelphia; then, after the easterly boundary of the ice-district had been reached, turned to the northeast, and steered in a direct line for Queenstown, passing within about three hundred miles of the Azores. By a "direct line," in this instance, is to be understood a curved one, the "rhumb line," or straight course on the chart, which was the favorite of our early studies in navigation, being now abandoned by steam-vessels for "great circle sailing," in which the ship pursues the theoretical trace on the surface of the globe of a plane passing through the centre of the earth, the ship and its destination, which shows itself on the chart as a curved line.

To follow this curve is a rather more delicate job than I had supposed. My early impressions had been that it was customary, after getting a good start in the right direction, to set "studding-sails" around in different parts of the ship, lash the helm to some convenient projections, pipe all hands to grog, and generally take things easy until the wind changed, or something happened to get in the way. Instead of this, however, I found that the steering apparatus, which consisted of a compact little engine, very much like a particularly pretty double-cylinder elevator engine, was in motion all the time, under control of a wheel in a little house on deck, in front of which was a compass, standing on a pillar like a sun-dial, and when, on going up to inspect the compass, I was earnestly requested to refrain from standing between it and the man at the wheel, I inferred that his movements must be controlled by constant observation of this instrument. This opinion was strengthened by an inspection of the chart, which showed that the course of the ship changed slightly from day to day, following an arc of some fifteen thousand miles radius, and my respect for the skill which could steer a vessel with accuracy around such a curve was made all the more oppressive by the recollection of some of my own performances with the tiller of a twelve-foot sail-boat.

The only thing that remained to be explained about the steering was the multiplicity of compasses. The fact that the direction of the north point in them did not in any case agree with what the chart would have made it, was easily accounted for by remembering that the various attractions of an iron ship usually draw a magnetic needle more or less from the path of duty; but there seemed to be no reason for putting four of the instruments in different parts of the vessel, including one about half-way up the mast, until it appeared that all of them were examined and compared regularly four times a day, and the exact variation calculated by some unknown formula from the total of the observations.

The course of the vessel took us in about twenty hours into the warm water of the Gulf Stream, and I was surprised to find how much of what might strictly be called landscape interest the sea affords. My recollections of a trip made a good many years ago included reminiscences of flying-fishes and thunder-storms in the Gulf Stream, and whales and porpoises in the colder water, but I had never before realized the interest of the meteorological phenomena occasioned by the transition from one current to the other, or the variations in the expression of sky and water which depend upon these phenomena. The passage from the Arctic current, which flows southward along the New England coast, into the Gulf Stream waters, was shown almost immediately by the change in the character of the air, which soon became not merely warm, but moist to saturation, giving one the sensation of being in a vapor bath. On deck, the atmosphere was very pleasant to one who enjoys a state of languid solution, and does not mind the soft showers which every breath of cool wind condenses out of the overloaded air; but the interior of the ship, after a few hours of ploughing through water at a temperature of seventy-five degrees Fahrenheit, became unpleasantly warm, and the passengers, as well as the captain, were rather glad to get across into the cool ocean beyond.

The captain's anxiety, it is needless to say, had nothing to do directly with the temperature, although it was due indirectly in part to the conditions dependent upon that temperature. So long as we remained in the warm water, the ship was surrounded by clouds, the characteristic, and to my mind most beautiful, clouds of the Gulf Stream, sometimes floating in soft, half-defined mist on the water, and sometimes lifting themselves into the forms which we call at home "thunder-heads," but moving always with a noble freedom and breadth of disposition which can be seen nowhere except at sea. What would have been the atmospheric effects produced by the neighborhood of an iceberg I cannot say, but presume that a dense fog would have been one of them, and that the rest would have been lost upon us. The captain, however, took good care to give us no opportunity for investigating the subject, keeping well out to the "safety line," and testing the temperature of the water every half-hour during the night, until the Gulf Stream and the danger of ice were passed together. At one testing the temperature, which had been

seventy-five half an hour before, sank to forty-five, showing that ice was or had been near, but subsequent trials, five minutes apart, showed no further depression, and the thermometer probably only reached the dissolved remembrance of an iceberg, drifting away southward in the cold current which underlies the warm but superficial one which we have been taught to call the northeast branch of the Gulf Stream.

On coming out from the warm current to the average Atlantic water, a process much more gradual than the transition from the Arctic current to the Gulf stream, the appearance of the sea, and still more that of the clouds, changed. The horizon, from an undetermined province between the air and the water, became, except where hidden by clouds, a distinct line, and the air lost its vapor-bath character, to take on a clear, congenial freshness such as one feels that he might live in forever. For all that the saturation-point, taking the temperature into consideration, must be always very nearly reached. This is shown partly by the frequency of light showers, but perhaps still more by the appearance of the flowering plants with which the saloon has been decorated ever since the morning of the day of sailing. Whoever does the selecting of these plants for the Cunard steamers shows a discrimination and knowledge which one cannot help envying him, and more beautiful specimens than the hydrangeas and pelargoniums which stand on the saloon tables I never saw. One of the latter, after remaining in its place for ten days, has still twenty perfect blossoms on it, half a dozen, perhaps, of those which it possessed on the sailing-day having withered and dropped off, while a white hydrangea keeps its single head of blossoms, about ten inches in diameter, as perfect as when it left the greenhouse in Boston. All the others are in similar condition, although no care has been taken of them, and it is doubtful whether they have even been watered since they started on their voyage. One would hardly care to fit up a floating greenhouse, and exile himself at sea for the rest of his life for the sake of growing flowers to advantage, but if I were condemned to pass the rest of my life on the water I would certainly try to enclose some sort of place about the ship where I could have the satisfaction of seeing plants flourish without danger of suffering from the dust, dryness and insects which so soon make an end of neglected house-plants ashore.

PICTURES OF THE SEASON IN NEW YORK.[1]—V.



TOMB OF THE PAINTER FAYOLLE. FRANCE.
M. CHESSAVARD, ARCHITECT.

IN my last chapter I noted one or two pictures in the current Prize Fund Exhibition, which showed an earnest and largely successful effort to deal with local, contemporary subjects. Another—which it is an especial pleasure to speak of as it comes from a hand hitherto all but unknown and, I believe, very young—is Mr. Boston's "Celestial Minstrel." The scene is the interior of a Chinese laundry with a seated Celestial playing on his queer guitar—if guitar it should be called—and two or three others pausing from their work to give him a half-abstracted attention. The composition is good, the drawing adequate, and the handling simple and clever. There is no brilliancy of color, but we do not complain; for the absence of all attempt at it helps to prove that it was not the superficially "decorative" value of the theme which attracted the artist so much as its human interest. This is what made it valuable in his eyes and this he has interpreted so that we too feel its force; and I think it is no small praise to say so, since it is hard for us terrestrials ever to feel that we are really humanly at one with the inhabitants of the Flowery Kingdom. Mr. Boston's Chinese, however, are not mere grotesque bits of *bric-à-brac* or mere unvital factors in a decorative scheme. They are genuine, humble, living washer-men with souls—or at least with temperaments—akin to ours. We feel ourselves in sympathy with them, and are touched ourselves by the suggested pathos of the strain which touches them. It is not a great picture by any means, or even a beautiful one; but it claims our respect by its seriousness of aim, its straight-forwardness of method, and its quality of genuine feeling; as well as, I may say once more, by its commendable dealing with a fresh and local theme. I am by no means alone in my disappointment that it did not secure one of the minor prizes of the exhibition; one of the ten gold medals given by the Art Association.

Some of these medals went to pictures which do not seem to me especially noteworthy; but two fell to Mr. Marr's "Gossip," and Mr. Gaul's "Holding the Line," which have already been described in these columns; one was given to a charming landscape by Mr. Charles Davis—good in execution and with much individuality of sentiment; two more to good landscapes by Mr. Parton and Mr. Tryon, and still another to Mr. Kappes's negro *genre*, called "Tattered and Torn." Mr. Kappes has long been known for his clever and artistic treatment of similar themes; but never before, so far as his works are familiar to me, had he done quite so well as here. The one fault of the picture—its extremely chalky tone—distresses us at first sight; but we soon forget it in noting the really good color, the excellent drawing, the free and effective yet solid brush-work, and the extraordinarily vivid presentation of character. The old woman—a veritable bundle of rags and tags—who stands in the foreground about to light her pipe, watches her slow-kindling match with inimitable truth of gesture and expression, and the two old men confabing in the background are as vital and delightful as is Uncle Remus himself under the touch of a brother artist in another field. Here is indeed, a good example to show the difference between artistic *genre* painting, able to stand on its own feet, and painting fallen into "anec-dotage" (I quote the late Lord Beaconsfield), and needing to be propped up by verbal explanations. It is delightful to see an artist with a brush able to express such vivid meanings, and with an artistic instinct strong enough to take him to the utmost limits of humorous character-painting, and yet keep him from straying over into caricature. It would have been well indeed—considering alike mere pictorial completeness and commendable "Americanism" in choice of subject—if this picture had been given one of the main prizes, and a certain French peasant-girl been obliged to content herself with the hundred-dollar medal list instead.

Mr. Thomas Allen's "October Afternoon" is an interesting attempt—marred by the figures—to grapple with those American-autumn difficulties, amid which our early "Hudson River School" made shipwreck. Mr. Alexander Harrison's "Surf" is a charming small version of a theme he has painted before. Mr. Bogg's "Thames, near the Tower of London;" Mr. Denman's "Venetian Well;" Mr. Fitz's "Mourning;" Mr. Murphy's "Pasture;" Mr. Walter Brown's "Market-Day, Isigny;" Mr. Coffin's "Moonlight Night;" Mr. Church's various fantasies; two or three other Venetian scenes by Mr. Ulrich (whose prize-canvas has already been mentioned), and landscapes by Mr. Gifford and Mr. George Smillie are among the good things on the walls. If I say that I do not pretend to be able to note them all it will be guessed that the exhibition is in truth a good one. And there are two or three others which must be noted despite the length to which my chronicle has already run. One of these is Mr. Alexander's full-length life-size portrait of the actor Gilbert in the white-satin costume worn, I think, in "She Stoops to Conquer." The figure is admirably posed, and the head is remarkable for verisimilitude, and for vivacity of expression rendered with extreme breadth and strength. But the lighting of the canvas is not a little eccentric, and the effect of the shadow of the long coat-flap is to make the lower part of the body vanish entirely from sight. The appearance was probably truthfully reproduced from nature—Mr. Alexander is so capable an artist that we may trust him in this—but it is unfortunate on canvas, none the less. Yet in spite of this one defect the picture is so strong and so interesting, and so individual that it, too, might well have secured a prize; especially as one of our museums would then have been the repository not only of a very fine piece of work, but also of a characteristic likeness of one of the best and most popular dramatic artists we have to boast of.

Mr. Poore has hitherto been known, and very favorably, as a painter, chiefly, of landscapes with sheep. This year he has made a new departure; his picture is a large one, called, "The Close of a City Day," and represents a bridge in Philadelphia crowded with wagons and artisans returning from work. It is not to be called a success; for it lacks charm of every kind and the artist's hand has been at fault in other ways as well as in that dramatic characterization which must be the very life and soul of such a work. But it is an honest, serious, and promising effort; its virtues are similar to those of Mr. Koehler's "Strike" at the recent Academy Exhibition; the desire to utilize in art "that which lieth nearest," and to paint for truth and not for effect; and its faults are also similar; faults of immaturity which allow us to believe in better things to come.

At the very opposite end of the artistic scale is Mr. Alden Weir's "Muse of History," welcome from the rarity of our efforts to deal with the ideal side of art. To be really ideal—to be ideally real—these are the two aims between which good art divides its strength. Mediocre art misses both, and is merely conventional, imitative, academic. I should not call Mr. Weir's pictures as successful as his "Muse of Music," exhibited some years ago—a trifle more of reality in the painting of the head and hands would have helped it up to the same level; but it is so beautifully painted, so charming in tone, and in a very delicate scale of color, and so refined, elevated and artistic in feeling that one cannot but thank the artist for another proof that he is one of the few we have who will, perhaps who can, follow "art for art's sake." For I fear there is no buying public to take an interest in a work of just this character.

Finally, I would say a word of Mr. Twachtman's large landscape, though it is extremely difficult to explain in print its peculiar charm. We may call it an "impressionist" picture if we will, though nothing could be more unlike to it than the French impressionist pictures we all have just been studying. It shows a stretch of lake with a long level hillside beyond, and a pale sky above broken by a few small clouds. Though the scale is so large there is absolutely no detail whatsoever, except a few water-weeds whose fringed heads are broadly touched in the foreground. At the first glance it may seem

[1] Continued from page 294, No. 547.

empty; but after it has been seen—perhaps I should say *felt*—for a moment, we find it is not so empty, but that it gives us a very strong and charming and individual impression. We perceive the effect that has been sought — that effect which is the slight blur rather than haze that follows a summer rain. We note the beautiful harmony of delicate color, the depth and freshness of the atmosphere, the grace of the utterly simple composition. We see, in short, that here is a true picture with a true charm and meaning of its own — and, I think, one of the most poetical landscapes we have had for a long while back.

I may add that the satisfaction felt with regard to this exhibition promises to result next year in subscriptions which will permit of the giving of more prizes than this year could be awarded; and also of the founding of one or two permanent scholarships insuring a period of foreign study to the recipient. On the whole, it seems as though the American public were being aroused both to the merit of the artists we already have and to the virtue of fostering the development of others.

Picture sales have succeeded one another all through the spring in unexampled numbers; and in more than one place the objects offered were of very great interest. But I have unfortunately seen few of them, and even if I could speak of them here, it would perhaps not be worth while. A mere catalogue of works long ago dispersed to private homes in all quarters of the land could not have much interest. That which was promised us as *the* picture of the season has not been allowed to appear after all, but will probably be shown in the autumn. I mean the Rembrandt portrait, known as "The Gilder," which Mr. Schaus purchased last summer from the collection of Madame de Cassin in Paris. It is not only an authentic but also a famous Rembrandt painted in his best period — in that which, with truly Teutonic sentimentality, one of his latest biographers (Herr Bode), calls "the reign of the golden-brown tone." It will be fortunate indeed if it can be kept permanently in this country.

I have spent a good many columns over minor matters while a work which seems to me much the most important product of the year has not yet been named. A few months ago Mr. La Farge placed in the chancel of the Church of the Incarnation on Madison Avenue a pair of pictures which are of extraordinary interest and value. Their subject is the Nativity, and their design is the same as that of the drawings made to illustrate a Christmas Hymn in the *Century* magazine three or four years ago. But a knowledge of the engravings does not at all prepare one for the effect of the paintings — the figures in which appear about life-size but are considerably larger. It is not only the addition of color which works the alteration by but the increase of scale also. The engravings were charming in feeling, as all work of Mr. La Farge's must be; but a certain confusion and indecision of effect therein perceptible has vanished from the paintings which have a largeness and grandeur of expression eminently desirable in monumental art. I need hardly say that the drawing is not academically correct — nor, on the other hand, that it is not incorrect in the usual sense so much as deliberately slighted. We may question theoretically, an artist's right to slight what Ingres proclaimed to be *la probité de l'art*. But, practically, the fact that he has done so does not disturb us in this instance — or perhaps I should speak more carefully and say it does not disturb *me*. It is not only that they have other excellences which outweigh their lack of accurately detailed draughtsmanship; — they have so peculiarly individual, original a charm and potency that I cannot find it in my heart to wish them altered in any way. I do not mean to say that they are charming and potent *because* their draughtsmanship is slurred. I merely mean that when these qualities are bound up with a technical idiosyncracy of any sort — even of a sort which theoretically is by no means excusable — one is tempted to feel that they would be impaired by the removal of that idiosyncracy. No artists — or very, very few — have ever had *all* gifts in combination — could ever bring all the elements of art up to their highest term and unite them all in a perfectly-balanced harmony. To almost every painter who has ever lived we have to grant undisturbed possession of *les défauts de ses qualités*. With one color has lacked, with another feeling, with another grace of composition, with another charm of physical type, with another effective chiaroscuro, with another that indefinable quality which means pictorial beauty in the widest sense. The lack of each of these we see with equanimity — but when it is "correct" drawing that goes overboard we are apt to cry out in protest. Yet sometimes even in this case the French phrase seems to fit — it seems as though the defects were inherent in the qualities, as though if *they* were eliminated the qualities themselves would have a weaker, or, at least, a different accent. And we are too well content with them to risk, even by a wish, any alteration. Perhaps such opinions will savor of an insufficient amount of critical conscientiousness upon my part. If so I can but frankly confess it is all I can muster as regards Mr. La Farge's work. I do not think I have been alone in wishing for many years that he might be set to do something of just this sort; and now that it is done, the result seems to me so extraordinarily fine as to still all criticisms (however just from a purely theoretic point of view) with regard to the defects — or limitations, or wilfulnesses, or mistakes — call them what you will — that have a share in it. Who is to prove that had the drawing been firmer and more explicit, part of their subtle, half-mysterious charm would not have vanished? And for myself, I venture to say once more, the charm is far more important than any "correctness" whatsoever could be.

After all of which I shall not in the least be able to explain the character of the pictures. How can one put into print the charm of noble, dignified, unaffected, yet truly religious, almost mystic sentiment, and of splendid color? These are big words I know, but I think I am justified in using them. I think I am right in saying that religious sentiment of this depth and strength, and still more of this individuality, originality, is uncommon, indeed, in modern art; and that it would be hard indeed to find another man alive to-day who could equal the depth, the richness, the harmony and, I repeat, the splendor of this color. Those who know what was Venetian color in its second period see that here it is born again — not in any imitation of any one Venetian master but in a new and kindred and most enchanting version.

The pictures are placed in the small semi-circular apse which finishes the chancel, divided by a marble panel bearing a cross in relief, based on a plinth to correspond and surmounted by elaborate Gothic canopy-work of an almost white tone, above which rises the gilded half-dome. The effect of the latter is fortunate, but to my eye the canopy-work is too heavy and its tone somewhat out of keeping. The pictures are nearly square and are painted in wax-colors, giving much the same effect as oil. That to the right shows the advent of the Kings of the East through a "purple midnight," and the other an anti-chamber where an angelic figure points a group of gazers towards an inner room where the Mother and Child are discerned. Here the supernatural flood of light contrasts effectively with the deeper tones of the other composition. In both, angel figures of smaller size hover above the heads of the human actors in the scene.

Of course it will be perceived that there has been no attempt at decorative painting in the strictly monumental, architectural sense. (And, of course, if there had been, absolute correctness of drawing and definiteness of outline would have been indeed essential.) They are merely pictures like any others, only in size and sentiment and execution suitable for the decoration of a church. It is useless to try and describe them further — all one can do is to deplore that they are not likely to be so generally seen of men as they would have been in earlier days of ecclesiastic art. But the mere fact that ecclesiastic art of such a kind is again coming to be desired is hopeful for the future. Ours, we know, is emphatically an age of "realism," and there is no possible need to deplore the fact. But neither, as I have said above, is there any need to feel that the fact must exclude all effort of an idealistic sort. All we need fear is confusion of aim, want of clearness in the direction of effort. Idealism is as valuable, as interesting, as needed to-day as ever before — if it can be true and noble and vital and not imitative, academic; if it can keep to its own high ground and not degenerate into cold abstractions on the one hand or weak sentimentalism on the other. That it *can* Mr. La Farge has clearly proved. And one trusts he will as clearly prove it again in a still more important work for which he has just received the commission. This is to be an immense picture of the Ascension which will fill the whole upper part of the flat chancel-end in the church of the same name on Fifth Avenue.

M. G. VAN RENSSELAER.

THE ILLUSTRATIONS

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE PRODUCE EXCHANGE, NEW YORK, N. Y. MR. GEORGE B. POST, ARCHITECT, NEW YORK, N. Y.

[Gelatine print issued only with the Imperial and Gelatine editions.]

THE best architectural illustration that we have ever seen in an unprofessional publication is the view of the New York Produce Exchange, after a drawing by Mr. Woodward, which appears in "*Harper's Magazine*" for July. As we had prepared for publication this week certain fragments of the building, we were particularly interested in Mr. Wheatly's paper, from which we extract the following description of the building itself:

The New York Produce Exchange is one of the most conspicuous buildings on Manhattan Island, the seat of the most influential mercantile corporation within its limits, and the market in whose exchanges the entire national commonwealth is most deeply interested. "Like a beetling cliff commanding the eye of the home-bound mariner," it challenges the notice of travellers approaching through the Narrows, or crossing the Hudson from the further shore. Its massive campanile shares with the lace-like Brooklyn Bridge, the spire of Trinity Church, the tall tower of the *Tribune*, and the ambitious altitude of the Equitable and Western Union structures the admiration of the stranger.

In view of the purposes this edifice is designed to serve, it is architecturally unrivalled by any in this or any other country. Of the modern Renaissance in style, and marked by symmetrically beautiful lines, its general effect is imposing, and imparts the idea of strength and permanence. The Building Committee knew what they wanted, and were fortunate enough to find in George B. Post, the architect, a trained artist abundantly able to unite their original designs with the graces of elegance and uniformity. Begun on May 1, 1881, it

was finished on May 1, 1884. Fifteen thousand and thirty-seven New England pine and spruce piles, driven through the yielding primitive soil to a solid bed, and cut off below the level of tide-water, insure the safety of the superstructure, and by their uprightness are supposed to harmonize with the mercantile men and morals they uphold. The building is fire-proof throughout. Granite, brick, terra-cotta, and iron are piled above the corner-stone—bearing in lasting bronze the word "Equity," that was laid with imposing ceremony on the 6th of June, 1882—and compose an edifice 300 by 150 feet in superficial area, and with tower and terrace, of 53,779 square feet. One hundred and sixteen feet measure the distance from sidewalk to roof, 225 feet to the coping of the tower, and 306 feet to the top of the flag-staff. Of course we are not surprised when told that the flag, 50 x 20 feet, is the largest ever made. The tower clock has a face twelve feet in diameter, each number measuring a foot in length, and weighs 1500 pounds.

The Produce Exchange, costing with land and furniture a grand total of $3,178,645.14, is a valuable index of progressive wealth and civilization. It includes 12,000,000 bricks, 15 miles of iron girders, $1\frac{3}{4}$ miles of columns, 2061 tons of terra-cotta, $7\frac{1}{2}$ acres of flooring, more than 2000 windows, nearly 1000 doors, $7\frac{1}{2}$ miles of sash cords and chains, over 47 tons of sash weights, $\frac{1}{8}$ of an acre of skylight over the Exchange Room, 29 miles of steam-pipes, nearly a mile of panelled wainscoting, and weighs over 50,000 tons. Four thousand separate drawings were required for its construction. The 9 hydraulic elevators carry an average of 21,500 people daily, or 6,500,000 every year. The pumping capacity is sufficient to supply water to a city of 175,000 inhabitants, and 1,194,133 horse-power is utilized annually for heat and force. All these items are of less practical interest to the members than the fact that the 190 offices rent, together with privileges, for about $180,000 per annum, not including premiums of over $24,000 paid for choice, and return about six per cent on the entire investment. With the rents and annual dues there will be in 1886 a net surplus above interest and expenses of $40,000. This income will, of course, increase as the bonded debt decreases. When the latter is liquidated, the Exchange will enjoy a net income of about $200,000 a year, which may be applied to the reduction either of dues or of gratuity assessments.

EXTERIOR VIEW OF ST. PETER'S, ROME, AFTER AN ETCHING BY G. B. PIRANESI.

The patron in art and literature is an institution of the past, and one not much regretted in general, yet many invaluable works might never have seen the light had it not been for his generous vanity. Piranesi was greatly assisted in the publication of his large and costly volumes of prints by various patrons, conspicuous among whom were several English noblemen. With one of these, Lord Charlemont, to whom Piranesi's "*Roman Antiquities*" (4 vols., 1756) was to have been dedicated, he quarrelled, and the Englishman's name and coat-of-arms were cancelled from the plates after a few copies were issued. The next year Piranesi engraved and printed a small volume for private circulation among his friends, giving his reasons for the change. This shows that even patrons were sometimes distasteful to artists, but one cannot help wishing that poor Méryon might have had one who would have enabled him to do for Paris what Piranesi did for Rome.

This Italian designer was one of the most fertile artists ever known, being credited with some two thousand plates, many of large and some of enormous size, some of them being ten feet in length. In his work he was assisted by three sons and three daughters, as well as several pupils. Chief among these was his son Francesco (his most successful imitator) and his daughter Laura. After Piranesi's death, this Francesco was sent to Paris as minister for the Roman Republic, and there, having taken with him the plates, he published a complete edition of his father's works in twenty-nine large volumes. The greater part of these represent the antiquities and monuments of Rome, whose stately ruins Piranesi never tired of copying. Francesco died in 1810, and the plates were purchased by the famous house of Didot, but were afterwards secured by the Roman Government and are now in the Vatican.

Piranesi's works may be divided into three classes: first, architectural designs and restorations; second, sketches of ruins; third, etchings known as "prison sketches." He was a practical architect, and designed many buildings, all or almost all restorations of the antique in style and feeling. As a modern scientist reconstructs some extinct monster from a tooth, so would Piranesi create a pile of antique magnificence from a single fragment of carved stone. He was a thorough student, and always tested by severe methods his ideas before putting them into execution. Among his multitudinous works is a large portfolio, "*Divers Manners of Ornamenting Chimneys*," which contains a hundred different sketches, each design being perfectly new. In Italy Piranesi is called, and deservedly, the father of the Classical Renaissance of the eighteenth century.

He has been charged with undue use of his imagination in his pictures of ancient ruins and with incorrect work in his restorations, but, as a whole, these charges are not sustained. There is, however, something exaggerated, theatric and scene-painter-like in many of his plates, and one wonders if he ever used his remarkable talents in the service of the stage. The Italian painter Pannini, who worked in Rome at the same time, and painted the same subjects, was never able to present them with the brilliancy of execution which the ardent Piranesi imparted. The etchings of the latter artist have a color in their blacks which far outshines the pale tints of "perspective Pannini's" learned paintings. Piranesi worked with great facility and freedom, usually drawing at once upon the plate and finishing it by etching, using the graver sparingly. His skill in composition, his wealth of detail and his truth of effect are astonishing, and his handling of light and shade has given him the designation of "the Rembrandt of Architecture." The foregrounds of his pictures are usually filled with a number of animated figures, which afford interesting studies of the costumes and manners of the time.

From a lamp to a temple, from a vase to a theatre, or from a tripod to a palace, his ready pencil flew and found nothing beneath its notice or beyond its powers. St. Peter's, the Pantheon, Trajan's Column, the Arch of Titus, the Forum, Herculaneum, Pompeii, frieze, bust, picture and statue—all are recorded in his books, which form a colossal monument to ancient art.

His prison sketches, or "*Carceri*," are a wonderful collection of strange and awful dreams in which is shown, with impressive monotony, prisoners confined and tortured in terrible dungeons, from which there is no hope of escape. All the accessories which a singularly strong and (at the time these drawings were made), wild imagination could conceive as likely to add to the horror of the scenes are introduced.

T. H. S. Escott, from whose fine and appreciative article in "*Belgravia*" (1869), the writer has drawn many of the statements here given, likens Piranesi to Doré, and declares that the latter was indebted to the Italian for many of his weird and fantastic imaginings.

A difference exists among biographers as to the exact place and date of Piranesi's birth, but it undoubtedly occurred in Venice in 1720. It is certain that on the title-page of his book he calls himself a "Venetian architect," and beneath his portrait, engraved by his son, in the first volume of it says that he lived fifty-eight years and died in 1778.

In youth he was precociously clever in drawing and designing architectural works, and was also noted for his extraordinary beauty. His ancestors had been successful merchants, and the parents of young Piranesi destined him for commerce; but art had stronger attractions, and their preferences were disregarded. He felt an irresistible longing to go to Rome and study art there, and to the objection of his father he only said, "I am called to Rome, and to Rome I must go." So to the seven-hilled city went the youthful artist, and there studied under the eminent Vasi, a Sicilian draughtsman and engraver, then considered the greatest master of architectural drawing in Europe. He was an able teacher, but too conventional in manner for Piranesi who quarrelled with him, and upon being struck by Vasi in his anger, retaliated with such effect that the master narrowly escaped atoning for his violence with his life. Piranesi was forced to return to Venice, but we find him in Rome again two years later, and are told this romantic story of his marriage which took place there. Drawing one day in the Campo Vaccino, he saw pass before him two sisters, one young and, the legend says, very lovely. Piranesi glanced up from his work. His fancy was taken, and his mind decided. "*Est elle à marier, la belle enfant?*" was his inquiry of the elder sister. The reply was in the affirmative, and the artist, if the account of his French biographer be worthy of credit, quietly packed up his sketching materials, made an appropriate declaration of his sudden passion, and conducted his bride to the nearest church, where the wedding ceremony was duly performed. The marriage was a happy one, we are glad to know. His first work, which was one upon triumphal arches and bridges, was issued in 1741. He was knighted by Clement XIII, and elected an honorary member of the Society of Antiquaries in London. At the request of this Pope he repaired and decorated the Church of Santa Maria del Popolo, in Rome. In temperament he was impulsive and passionate, passing from one extreme of feeling to the other. He was subject to fits of despair and dejection, and at times of absolute delirium, when he imagined himself—to use his own words—"suffering the endless tortures of a prison-house, from which there is no escape." It was while in these seizures that he drew the "prison sketches" before referred to, and few stranger records of mental agony can be seen. He died at Rome in 1778, and was buried there. A statue by Angolini helps to preserve the name of Cavaliere Giovanni Baptista Piranesi, architect, designer and engraver; but his best and imperishable memorial is the set of magnificent folios wherein his genius has so lavishly portrayed the mighty monuments of Imperial Rome.

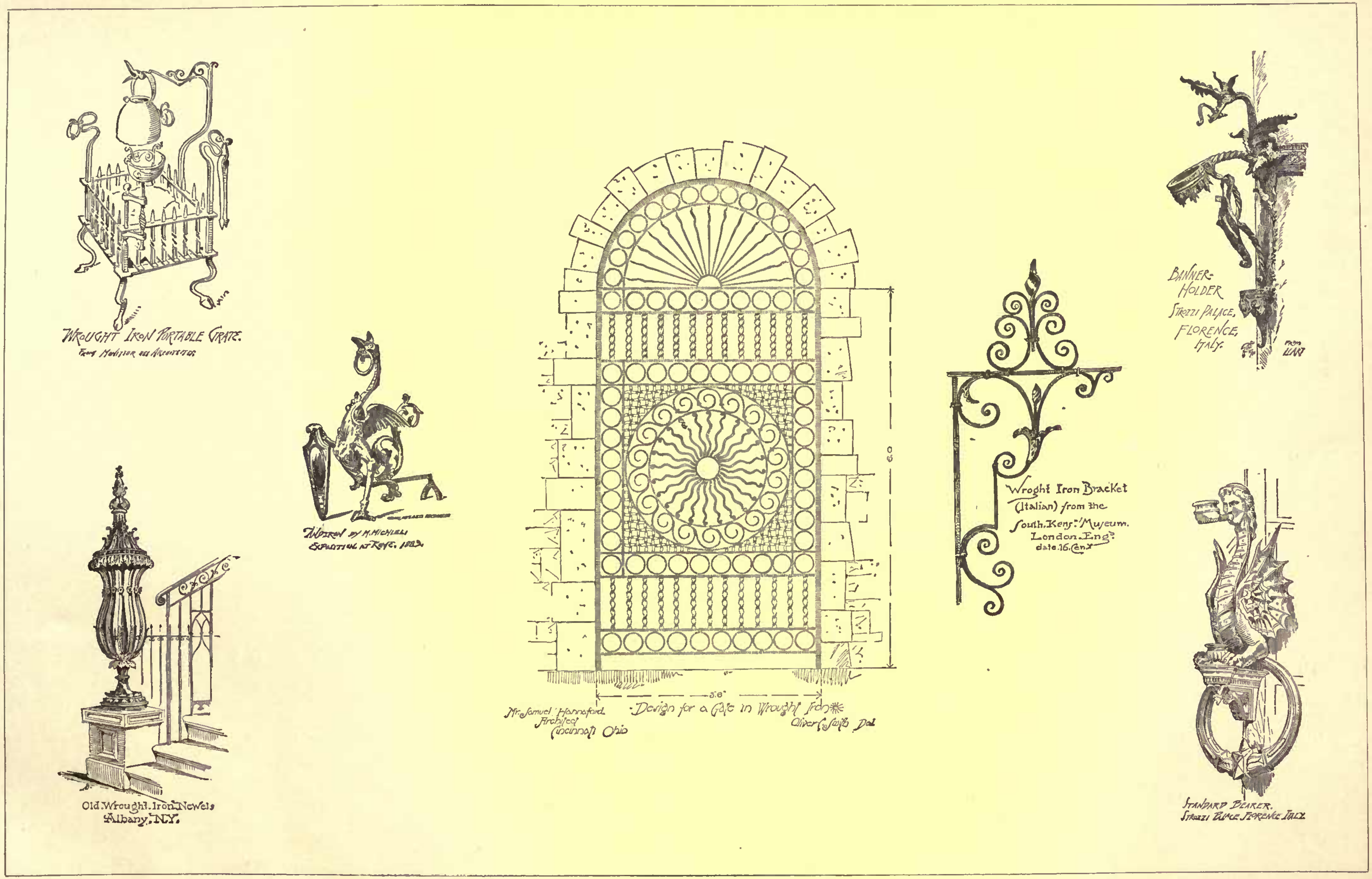
COTTAGE FOR DR. F. W. CHAPIN, POMFRET, CONN. MR. HOWARD HOPPIN, ARCHITECT, PROVIDENCE, R. I.

This cottage was built especially for a summer dwelling; is shingled entirely—shingles left in natural color of the wood. The house stands on a bold hill-top, commanding the main road and an extensive view.

HOUSE OF MR. H. G. MARQUAND, ESQ., NEW YORK, N. Y. MR. R. M. HUNT, ARCHITECT, NEW YORK, N. Y.

ENTRANCE PORCH OF THE SWEDENBORGIAN CHURCH, PHILADELPHIA, PA. MR. T. P. CHANDLER, JR., ARCHITECT, PHILADELPHIA, PA.

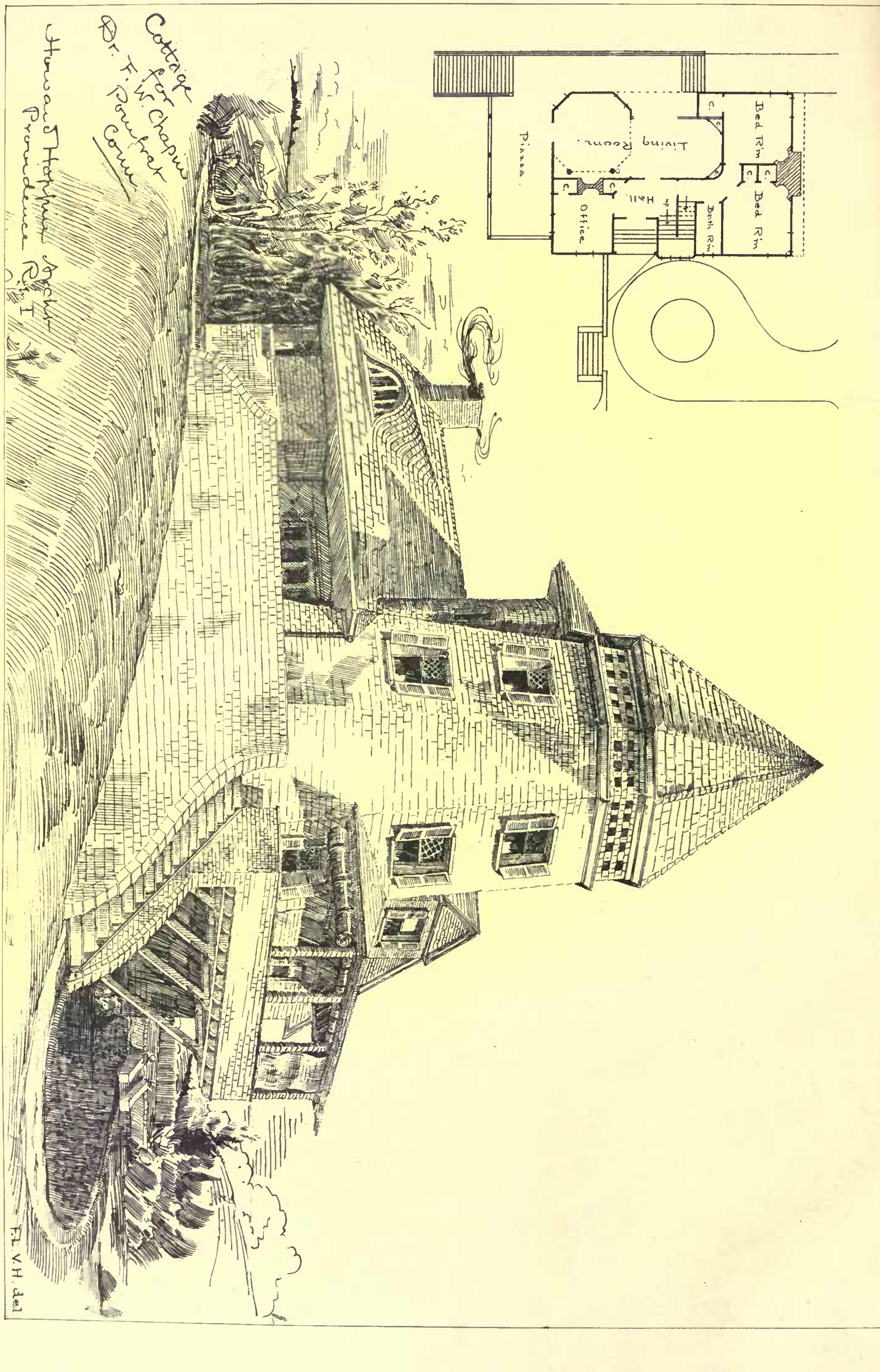
SKETCH OF HOUSE AT PATERSON, N. J. MR. CHAS. EDWARDS, ARCHITECT, PATERSON, N. J.



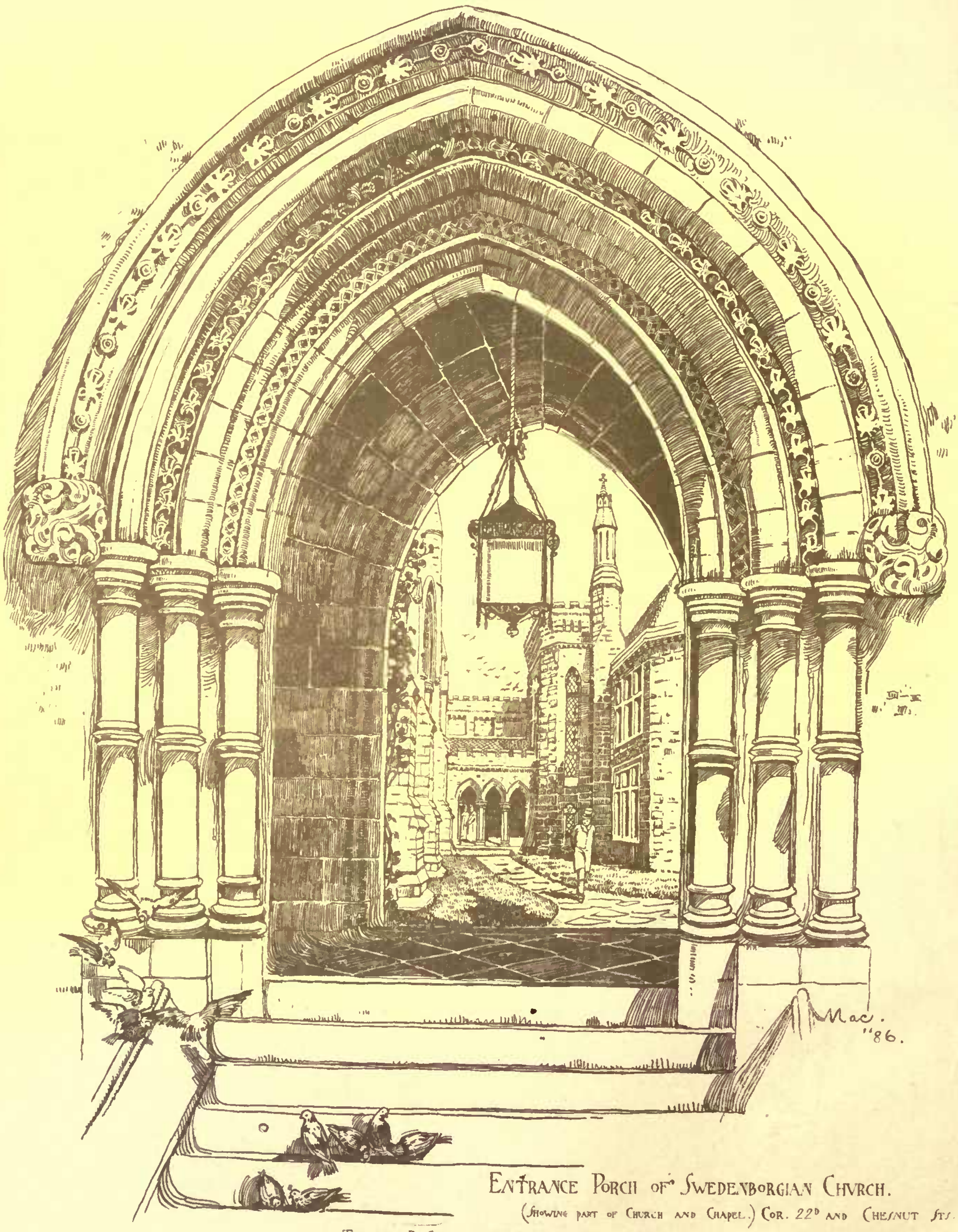
WROUGHT METAL WORK.

No. 543 AMERICAN ARCHITECT AND BUILDING NEWS, JUNE 26 1886.

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Entrance Porch of Swedenborgian Church.

(Showing part of Church and Chapel.) Cor. 22D and Chesnut Sts.

Theophilus P. Chandler, Architect, 302 Walnut St. Phil'a. Philadelphia. Pa.

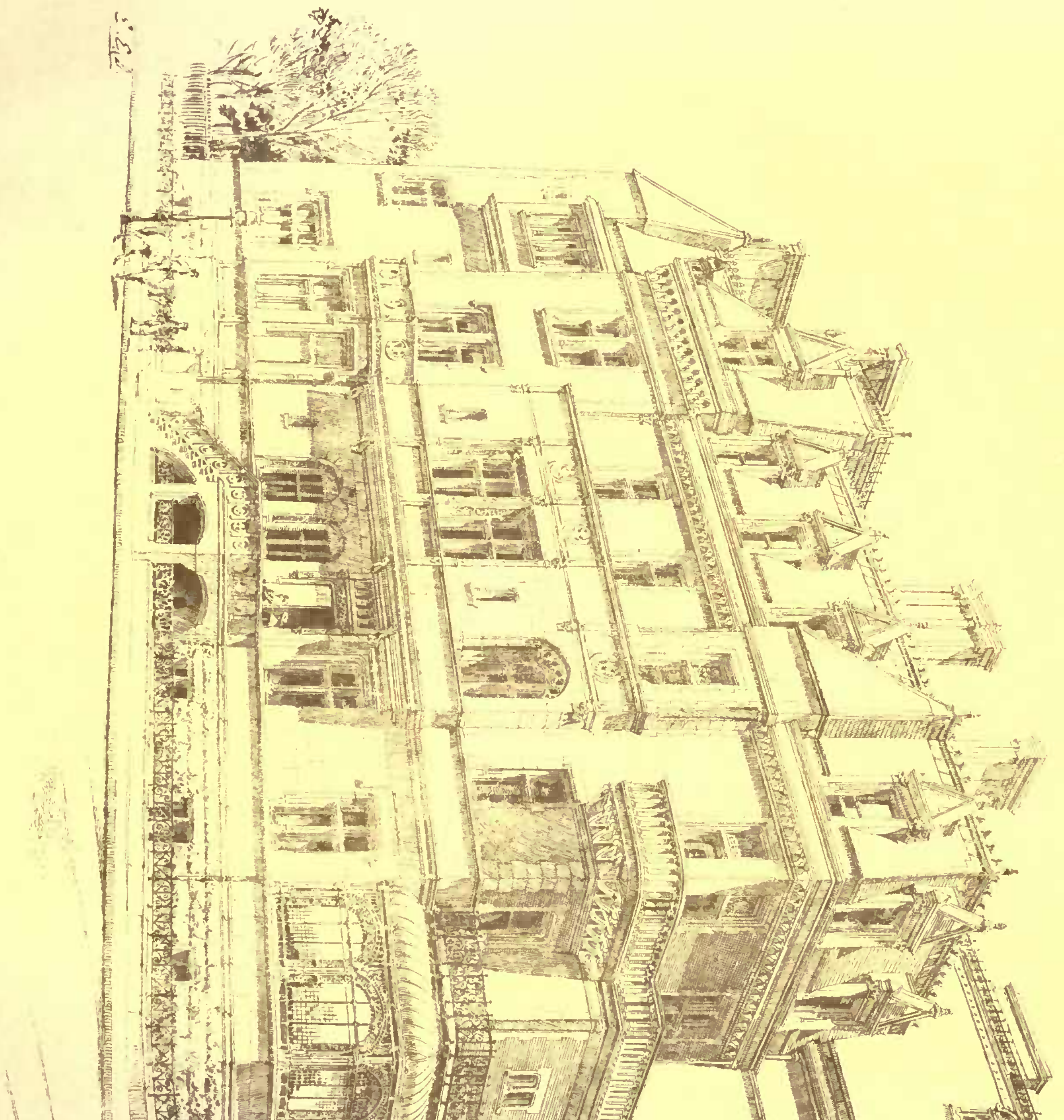
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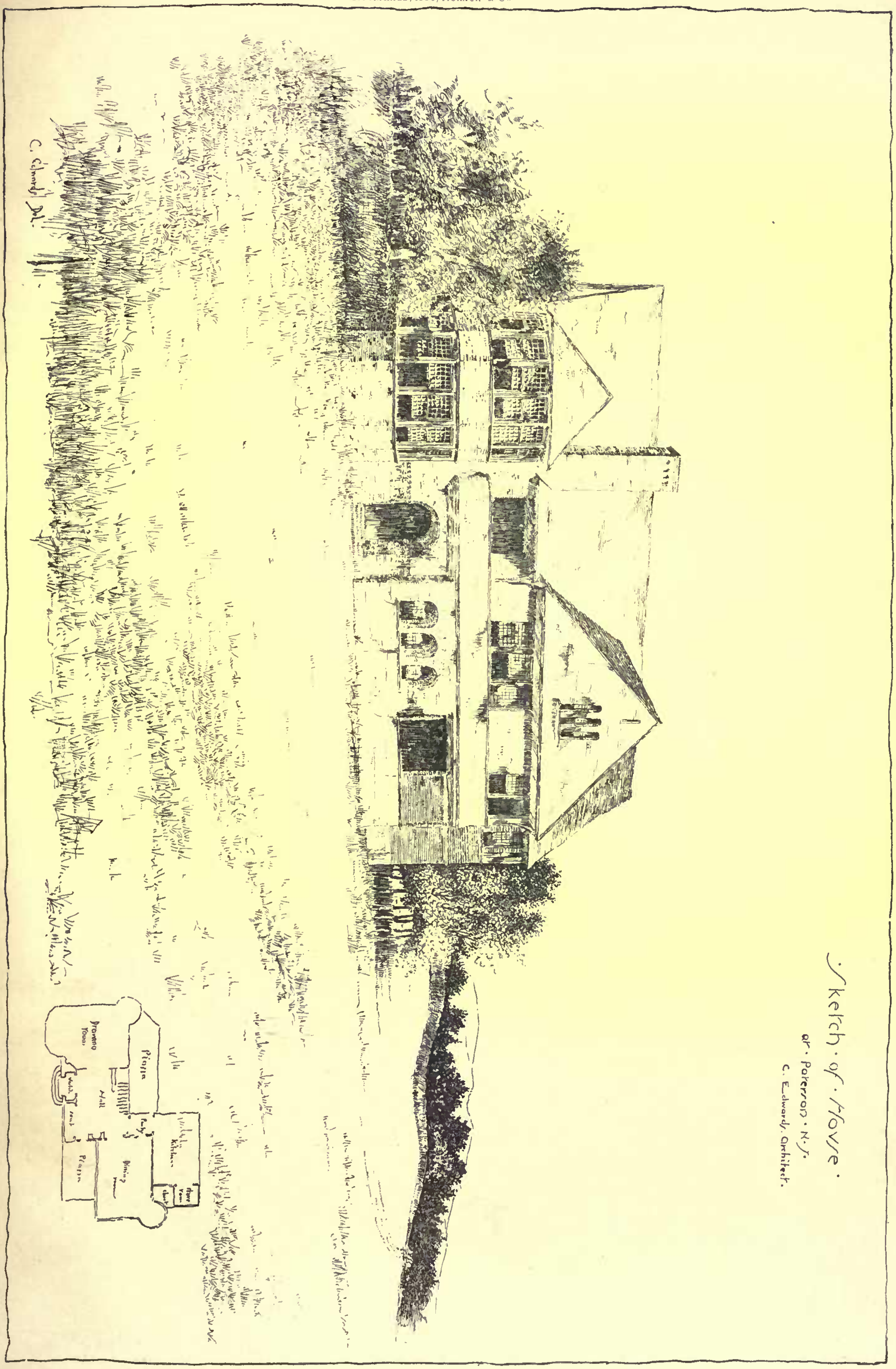
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RESIDENCE of Mr H. G. MARQUAND. 68 MADISON AVE N.Y.

Mr R. M. Hunt Architect

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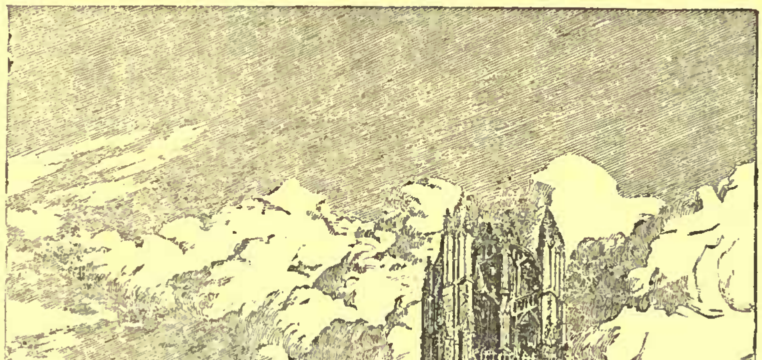


HELIOTYPE PRINTING CO. BOSTON.

ARIZONA ANTIQUITIES.

ALTHOUGH Florence, unlike Tucson and some other towns in the Territory, cannot claim an age dating from centuries ago, it is not without attractions to those who take an interest in antiquarian subjects, as it is built almost on the site of one of the cities whose pre-historic ruins are scattered all over Arizona. Of the people whose patient and intelligent toil created them there is not even a tradition, the only proof that they ever existed being these fast perishing remains of what were once imposing structures, a few fragments of utensils, and the long dried-up beds of their extensive irrigating canals. The foundations of many of the buildings here are still plainly visible above the surface, and show that the edifices were of large proportions. Those who saw them twenty years ago say that many of the walls were then one-story high.

The most notable and the best-preserved remains in the Territory are those at Casa Grande. These relics of a once large and populous city are situated about seven miles from Florence, and six from the Gila River. The location is on an immense plateau that shows signs of having been extensively cultivated. Accepting the invitation of a gentleman who has resided here many years, we drove out to this ancient spot, about which so much has been said and written, but of whose real history, or the history of those who lived here untold ages back, not even a vague legend exists. The antiquity of the ruins may be inferred from the fact that the Pima Indians, a once powerful and intelligent tribe, told Cabeza de Vaca, who, in his journey across the continent, came here in the early part of the sixteenth century, and was the first European to explore this region, that although their fathers had held possession of the country for unnumbered generations, they were unable to furnish a clue to the origin, career or fate of those who had preceded them. The other tribes were equally ignorant on the subject, yet all claimed, as their descendants now do, to have well-authenticated traditions proving their occupancy of the country for many centuries. It is also known that many of the tribes found here when the Europeans first visited the country were far more advanced in civilization than the average North American Indians, since they owned flocks and herds, and manufactured coarse garments of cotton and wool. The next explorer was Marcos de Niza, who travelled through Arizona to the Zuñi towns between 1535 and 1540. They were again visited and more thoroughly examined by Coronada in 1541, when he led his famous expedition across Arizona in a futile search for the seven cities which he supposed contained enormous treasures of gold and silver. At that time the chief building, a portion of whose walls is yet standing, was represented as having four distinct stories. But as three full stories and a portion of the fourth yet stand, there is reason for thinking the structure must have been far more perfect at the first-mentioned period. These conclusions are strongly supported by citizens now residing here. The Hon. John J. Devine, who accompanied your correspondent to the ruins, and to whose kindness the writer is indebted for much valuable information, says that when he first saw the building about twenty years ago there were five stories intact. The joists that supported the different floors were in place and perfectly sound. They consisted of round pine poles between six and eight inches in diameter, and showed that they had been cut with a blunt instrument. As there are no forests of that wood nearer than forty miles from the site of the old city, the labor of cutting and transporting them must have been very great, as the facilities for moving such materials were unquestionably meagre. At present not a vestige of the woodwork remains. The joists are said to have been carried away by sight-seers, who within the past few years have visited the place in great numbers, and, in a spirit of vandalism, appropriated everything that could be removed, and in their anxiety to extricate the timbers from the walls they have accelerated the destruction of the latter.



La Tour Saint Laurent, Rouen, France.
From the *Moniteur des Architectes.*

The walls of the structure were of concrete composed of clay, gravel, and micaceous sand held together with cement. The greatest care was taken in the construction, each wall consisting of a solid mass. The mortar was evidently pounded or pressed into shape, and the walls, from all appearances, were formed in a frame or box which was afterwards removed. The inside was plastered with a fine cement that is to-day as hard and smooth as when first put on; the only breaks being where the water has run down from the top in more than ordinary quantities, or where some unusual force has come in contact with it. The preservation of this structure, although partly due to the character of the climate and the unusually pure atmosphere, must in the main be credited to the superior workmanship of its builders and the quality of materials used. If this was not the case, the rain, which at times descends in sheets, would soon have destroyed these walls, as it does those of modern brick if left uncovered, as these ancient walls have been for unknown ages.

Although Cabeza de Vaca, Marcos de Niza, and Coronada all made written mention of Caza Grande ruins, the fullest account recorded by early visitors was by Fathers Kino and Mange, two Jesuit priests who visited them in 1694, and wrote extended descriptions of the structure and surroundings, including the remains of many buildings of which little can now be seen except sufficient outlines of the foundations to designate their extent. In the statement of the last-named visitors, the main edifice was described as an oblong square facing the cardinal points of the compass, the exterior walls extending 420 feet from north to south, and 240 feet from east to west. This description was verified by Father Pedro Font, who saw the ruins in 1777. From his writings it is evident that little change had taken place during the century which had elapsed since the visit of Kino and Mange. The structure now standing, by an actual measurement made by your correspondent, is 42′ x 61′, and is divided into five halls. The middle rooms extend 26 feet north and south, and are of equal width. The end apartments reach entirely across the building, and are entered from the outside by a doorway. There are also doors leading from them to the other rooms. The passages are not over 36 inches wide, and about 5½ feet high. The peculiar separation of the different apartments has caused much speculation as to the purpose of the building; some imagine it was a fort, and those who saw it twenty years ago, before the fifth story had been thrown down, say it contained numerous small windows resembling loop-holes on every side. Others think it was a temple, and these rooms the inner chambers of the priests, while some suppose it to have been a prison, from the manner in which the interior was divided. The most plausible theory is that it was either the residence or office of rulers or important personages of some kind, as the rooms are too small to have contained a force sufficient for defence, too well finished to have been used as a prison, and altogether too circumscribed for a place of worship for the masses.

Regarding the dimensions as given by the Jesuits Kino and Mange, and repeated nearly one hundred years later by Font, it is proper to say that the general outlines of the building now standing do not fully confirm the measurements as recorded in their journals. In fact the present walls indicate the full length and breadth of the edifice; we see little evidence of connecting walls that since may have been thrown down and become covered with accumulating débris and drifting sands, although the outlines of many other large ruins are plainly marked. There is also a smaller ruin about one hundred feet from the main one. This structure is on a direct line

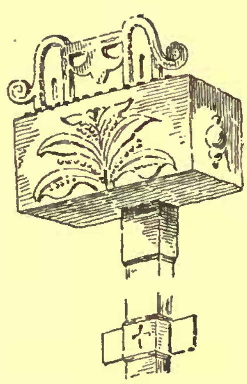
with the Casa Grande; it is between twenty and thirty feet square. Two stories are still standing, and the remnants of the walls strewn about the foundation indicate that it was originally a tall building. The general outlines as now seen suggest a tower; there are also evidences that the walls at one time extended from it nearly to the main structure, and those who saw the place a quarter of a century ago assert that there were then indications that what is now the main building was merely the inner temple of a much larger edifice, and the tower now standing was a portion of the great building so fully described by the Jesuit missionaries. This theory seems scarcely correct, as the outer walls of the Casa Grande are rough and have all the appearance of having been constructed like the exterior of an ordinary building; had it been an inner temple for the seclusion of the priests or other secret purposes, the walls would most likely have been made smooth on both sides.

A short distance from and parallel with these ruins, the outlines of the foundations of what was a very large structure, are plainly visible. The measurement of the north and south walls shows they were a trifle over three hundred feet long, and of proportionate width. This, doubtless, was one of the twelve other large buildings in the immediate vicinity of Casa Grande, of which mention was made by Fathers Kino, Mange, and Pedro Font in their respective journals. Evidences of other ruins of various proportions are many, and there are substantial reasons for thinking the place was once the site of a thickly populated city. A noticeable feature is the large quantities of broken pottery found in the neighborhood, and especially about the second large building; Colonel Devine humorously remarked that the structure was probably the king's kitchen, or crockery store. There is also an equal profusion of fragments of broken vessels observable at all the numerous town sites on the Gila Plateaux, and a number are observable within a few miles of the one just described. The pottery is coarse, and in every respect similar to that now manufactured and in common use among the Pima and Papago Indians of Arizona and the Pueblos of New Mexico. It is said by those who have made excavations among those ancient mounds that whole vessels are frequently found, and in many instances large ones identical with the ollas now in use among the Indians, mentioned as water vessels, have been unearthed, and not unfrequently they contain remains of grain, beans, or other matter that was used as food. In some instances the corn is said to have been fairly well preserved by being charred, and closely resembles the same species cultivated by the Arizona Indians at present. Much finer articles of pottery are said to have been unearthed in some localities. The decorations on these are represented as showing a high degree of artistic taste, and the fact that the figures have remained unchanged for untold centuries, although the vessels have been exposed to nearly every influence calculated to engender decay, is evidence of the superior character of the pigments used by the decorators.

The most perfect pieces of pottery yet found in considerable quantities have been obtained from caves or artificial habitations which the early dwellers excavated in the solid rocks. In one of these chambers one hundred and sixty pieces of this ancient ware were found some years ago, and are now in the possession of a citizen of the Territory, who refuses to part with them. In one of these rock dwellings numerous relics were found, including pieces of cotton cloth; these was dug up six feet below the surface of the floor as it existed when the explorers first entered it. The cloth was in a fair state of preservation, and showed that portions of it had been rudely embroidered. Pieces of coarse matting manufactured from a fibrous grass were also found in the same cave, and similar pieces have since been found in a number of other caves. Although the work of exploration has been imperfectly conducted, the excavations so far made justify predictions that while the origin and fate of the people the ruins of whose stone habitations are scattered over the foot-hills of the Mogollon, Burro, Sierra Ancha, and Mazatal Mountains, who carved enormous chambers in the faces of their bluffs, and reared structures of magnificent proportions in the valleys of the Gila, Salt, Beaver, Verde and other rivers in Arizona, are now shrouded in mystery, traces they have left behind will fully establish the fact that, considering the period at which they lived, and the disadvantages under which they labored, they accomplished wonderful results. Nor is it impossible that future discoveries among the ruins of these long tenantless abodes may furnish clues on which to base a theory as to their origin. That the builders were skilled in the science of architecture is attested by the remains already mentioned above. The numerous stone cisterns, and their conduits, laid in cement and so fairly preserved at the present day, and the irrigating canals that traverse the valleys and mesas of nearly every stream of consequence in the Territory, fully prove these were a people versed in engineering. The remains of the one that traversed the great Gila Mesa show it to have been over forty miles in length. That this acequia was located with superior skill is demonstrated by the fact that recent surveys by a company who are preparing to construct a canal through the same body of land, with a view to rendering it again arable, show that the route of the old, or, as it is more frequently called, the Aztec ditch, is the best that can be chosen; and the new artificial water-course will, it is said, follow nearly the same line as the one that made this plateau productive centuries ago.

That the country which it is sought to render productive by the construction now under contemplation supported a dense population is evident from the numerous ruins of villages and cities scattered over the great plain that was watered by the ancient acequia. An army officer of high rank who has spent the last fourteen years in Arizona informed the *Evening Post* correspondent that the area of the largest of these old cities justifies the supposition that it contained 75,000 people. His calculations were based on an estimate of the number of inhabitants in a city covering the same space at the present day. He thinks, however, that the population at that time was more dense. This conclusion is strongly supported by the results they accomplished, as no ordinary population could possibly have constructed the extensive edifices whose ruins are so profusely scattered over the country, and have dug the long miles of artificial water courses, or carved out the spacious chambers in the solid rocks such as are found in the cliffs along all the principal streams traversing the Territory. One of these cliff-dwellings is represented as nearly one hundred feet square, divided by partitions pierced by doorways leading from one room to another. The immensity of the labor required to accomplish this work will be more fully appreciated when it is remembered that those who did the work were unacquainted with the use of metallic tools. This is proved by the fact that not a single piece of iron, steel, and other metal has ever been unearthed from the tumuli, or found among the débris in the rock dwellings; the only instruments discovered being of stone, including hatchets, axes, mauls and other implements, some of which were evidently used for agricultural purposes, while others are supposed to have been employed in crushing grain, and still others for cutting and splitting wood. — *D. D. M. in the New York Evening Post.*

ARCHITECTURAL COMPETITION AND EXHIBITION, BRUSSELS.



RAIN WATER HEAD. WOODSOME HALL, YORKS, ENG. AFTER SKETCH BY W. RILEY.

It has been said that the Belgians possess the *esprit* of the French, combined with the plodding nature of the Germans. However that may be, the little nation of about five million inhabitants generally distinguishes itself at exhibitions, whether at home or abroad, and generally excels in the arts, worthily treading in the footsteps of Rubens and the grand old architects of the Middle Ages.

The Société Centrale d'Architecture de Belgique has determined that its exhibitions and competitions shall in future be triennial, and alternately national and international; and it has now celebrated its fourteenth year of existence by holding a competition and exhibition, this year national, in the Palais des Beaux-Arts, Brussels. This classical building, erected in 1880, after the designs of M. Balat, the king's architect, has lately received its complement of decoration in two bronze groups, "Le Génie des Arts," and "L'Enseignement des Arts," by Vinçotte and Stappart. The four statues surmounting the Aberdeen granite columns, with bronze bases and capitals, represent Architecture, Sculpture, Painting and Music, by Semain, Geefs, Melei and Brunin respectively; while the bust of Rubens occupies a central medallion between those of Jean de Boulogne and Jean von Ruysbroeck.

While arranging this exhibition, the Society sustained a severe loss in the death of M. Charles Neute, Secretary of the Organizing Committee, whose exertions secured the success of a former exhibition. The first room in the upper story of the Palais des Beaux-Arts was set apart for the exhibition of works by M. Neute and three other deceased Belgian architects: Poelaert, Schoy and Carpentier, round whose names wreaths of immortelles draped in crèpe were hung.

Eugene Carpentier, officer of the Order of Leopold, and effective member of the Royal Commission of Monuments, was born at Courtrai in 1819, and died at Selœil in 1878. He is represented by several drawings, including those of the Church of SS. Peter and Paul, at Châtelet; of St. Martin, at Thollembeek; of St. Peter at Antoing; of St. Martin, at Hyon; of the Parish Church of the Spa, in Roman architecture of the Cologne school; and of the fine old collegiate church of Notre Dame, at Huy, which is now under reconstruction; besides the Tournai *beffroi*, rebuilt in 1872.

Charles Neute, born at Saint Josse-ten-Noode in 1846, and deceased at Brussels in 1886, is represented by designs for a hospital at Antwerp, for which he obtained the third prize in the Society's first competition, and a design for a Hôtel Communal at Schaerbeek, for which he obtained the second prize in the competition opened by the Municipality; together with designs for the Hôtel Communal of Nimy, now under construction.

J. Poelaert, born at Brussels in 1817, and deceased there in 1879, has left abundant material for reminiscence; designs being shown of the church at Laeken, the Bourse du Commerce, Hôtel des Postes and Halles Centrales, Brussels; and his great work, the Brussels Palais de Justice.

A. Schoy, born at Brussels in 1838, and deceased there in 1885, has left his mark in the old church of Notre Dame du Sablon, Brussels; that of Sainte Gertrude at Nivelles; and a painted window to the memory of M. Thienpont, in the Church of Notre Dame de Pamele, at Audenarde.

An ingenious arrangement of symbols or mottoes concealing numbers, and numbers concealing names, that was adopted at the last

competition, for securing the absolute incognito of competitors, was in force on this occasion; and there was a further innovation in making the value of prize awarded—that is to say, the distribution of the sum available — depend upon the value of the drawings. This was accomplished by giving so many points for the plans, elevations, etc., the number being proportioned to their importance, while a minimum of points was required to secure a prize.

The subject for competition was a café-restaurant, on an irregular trapezoidal plot of ground at the corner of two streets forming an acute angle. The site is not imaginary, being one near the Galéries Saint Hubert, Brussels, at the corner of the Rue du Marché aux Herbes and the Rue de la Montagne. The subject includes café, restaurant, kitchen, etc., on the ground floor; an assembly-room and dependencies, with separate entrance, on the first floor; and *appartements* of three or four rooms each on the third, with access by the first-floor staircase.

The choice of style was left to competitors, who were to give the building as original a character as possible, and had to send in the following drawings, to which the annexed number of points was assigned: —

	Points.	
Plan of basement	5	
" ground floor	12	
" first floor	8	
" second floor	6	
" roof	2	
		33
Front and side elevations		27
Section		9
Details		16
Perspective view		5
Ensemble		10
Total		100

The three members of the Society who constituted the jury were M. Acker, M. Baes (Past President), and M. Dumortier (President); and there were ten competitors, besides one disqualified by incompleteness of drawings. The first prize was withheld, owing to insufficiency of points; but the second was awarded to M. J. Hubrecht, of Bruges; the third (*ex æquo*) to M. O. Francotte and M. Van Beesen, of Brussels; while M. A. Hauzeur, of Liege, was honorably mentioned.

The exhibition is divided into a modern and a retrospective section; the former being subdivided into nine classes, viz.: ecclesiastical, funereal or monumental, civil, scholastic, hospital, domestic, military and municipal architecture, with sketches and fragments.

The best drawing in the first class, in bold black lines on white ground, is an elevation of the choir and transept, after restoration, of the Eglise de la Chapelle, Brussels, lent by the Municipality. M. J. Bilmeyer and M. J. Van Riel contribute a perspective view, in thirteenth-century Gothic, of the apse of the Basilica of the Sacred Heart, at Antwerp. M. A. Eul has sent an original design, approved but not yet executed, for a Protestant church at Antonstadt, a faubourg of Dresden, and another for Chemnitz. M. E. Gife has sent designs of various parts of the Antwerp Cathedral, to serve for its restoration; and also a project for restoring the church of Notre Dame, at Aersebot. M. J. Rau contributed a very original design for an English church in the Upper Engadine, Switzerland, with clergyman's house over the porch.

In the second class, M. J. Bilmeyer and M. J. Van Riel sends a design for a funeral monument, in which they have adopted the English treatment of the Gothic style; and M. Charles Dewulf, a pupil, his cemetery design which gained the 1000-franc prize offered by the Belgian Royal Academy in 1885.

The third class, civil architecture, includes M. J. Bac's competitive design for a monumental entrance to a tunnel through the Alps, designed in harmony with its rugged surroundings. M. G. Bordian sends the front and side elevations and a transverse section of last year's Antwerp Exhibition, a great portion of the ironwork of which comes in for this year's exhibition at Liverpool. The Brussels Municipal authorities put in several designs of the fine old Gothic Hôtel de Ville in its present state, and with projected restoration by M. V. Jamaer, the City Architect. M. P. P. J. Saintenoy contributes a design for a Hôtel de Ville, in red brick, with bluestone facings, treated in the Antwerp manner of the sixteenth-century Flemish style.

In the fourth class, scholastic architecture, the Brussels Municipality has lent a fine drawing of the Brussels Académie Royale des Beaux-Arts, to which a wing was added in 1876. In this class there is a set of designs for a double primary school for one thousand children, by the late M. Carpentier. The building is simple and elegant; not a palace, as are some of the Brussels schools, but admirably adapted to its purpose. M. E. Hendrickx shows his plans for the Ecole modèle in the Boulevard du Hainaut, Brussels, which is very well built, but has the serious defect that there is no cloak-room.

There was only one exhibit in the fifth class, "Hospital Architecture," that of Mr. J. Bilmeyer and Mr. J. Van Riel, who showed a complete set of designs of the Stuyvenberg Hospital at Antwerp. The circular system of completely isolated wards is adopted, with central heating and ventilation; the beds being arranged radially, so as to avoid draughts. There are, moreover, no internal corners in which miasmata can harbor, and even the roof is curved at the angles.

In Class 6, Domestic Architecture, the Brussels Town Council has lent the designs of the historical façades in the Grand Place, including those of the Mercers' and the Tailors' guilds. M. E. Acker sends a remarkable front elevation in Florentine Renaissance, and M. J. Baes some plans of cottages in Belgium, Holland and England; while M. G. Bordian contributes a design for a château for the Duchess of Nassau at Königstein, and also a drawing of the same as executed.

Nearly all the exhibits in Class 8, "*Travaux d'Edilité*," or Municipal Work, consist of projects for affording communication between the upper and lower towns or portions of Brussels, and for improving the Rue Montagne de la Cour. There have been in all a hundred and eighty proposals for straightening this old and picturesque street, and eighteen of these, the best, are exhibited. On Sunday week M. Enghels, major in the Engineer Corps at Ghent, lectured on the subject, from a plan which he drew in chalk on the floor. For its monumental character, the plan of M. De Curte is the most interesting, and that of M. Menessier the most economical. We would venture, however, to propose a still more economical solution of the difficulty. The Montagne de la Cour is a favorite and representative street of Brussels, the shops of which, though not large or imposing, are attractive through their quaintness and the taste with which the windows are dressed. Moreover, this is the shortest cut from the Grand Place in the lower town to the Place Royal in the upper. But the gradient is very sharp, and the street very narrow, thus leading to carriage accidents. We would propose to preserve the quaint old street just as it is, and to close it entirely against all but foot-passengers, and to supersede it for carriage-traffic by widening and improving the streets to the right and left.

The ninth class, though consisting only of scraps, sketches and drawings of existing buildings, is among the most interesting. A sketch of a portion of the pulpit at the Stuyvenburg Church, near Antwerp, by the late M. L. Baekelmans, is remarkably well done. M. H. Baes shows his rich decoration of the Scala Theatre at Antwerp, and also that of last year's exhibition at Antwerp, which will come in for Liverpool this year. M. J. B. Capronnier sends designs (now executed) for stained-glass windows in Tournai Cathedral, and M. J. Dewæl some good water-color sketches. Some minute and elaborate pen-and-ink sketches by M. E. Geefs, son of the celebrated sculptor, show a remarkable sureness of hand. M. P. Hankar contributes the design of a lantern in wrought-iron for the staircase of the Château de Wespelaer; and M. J. Hubert some sketches of a building at Chievres, in the Province of Hainault, dating from the early part of the twelfth century. M. P. Jaspar sends a fine design of the well-known Mont-de-Piété, at Liége, built in the style of the Flemish Renaissance; and M. F. Laureys some elaborate diagrams giving a comparison of the proportions of the Doric Order in the ancient edifices of Greece and Italy.

Turning now to the retrospective section: two trophies destined eventually for the Musée Communal and lent by the Brussels Municipal College, are composed of plaster casts, and in some cases actual fragments from the Hôtel de Ville, the Broodhuis or Maison du Roi (the restoration of which is almost completed), and the Eglise de la Chapelle. These relics of the past ranging from the end of the twelfth to the beginning of the sixteenth century, afford abundant food for study to the architect and archæologist.

The parish Church of Saint Gery, fifteenth-century Gothic, built on one of the numerous islets of the Senne, with the houses clustering round it, formed the nucleus of ancient Brussels. This was pulled down in MDCCIC, the seventh year of the French Republic; but an exterior, an interior and a view during demolition are lent by M. Renier Chalon. M. W. Khünen lends an old engraving representing the ancient "Cour de Brusselles" (*sic*), the Curia Brabantiæ, or palace of the Dukes Brabant, in which is seen the inner court with its fine "*perron*" or flight of steps, giving access to the large hall in which Charles V abdicated in favor of his son Philip II. There is an engraving, lent by Mr. Van Hardenberg, of the "magnifique chapelle ardante" (*sic*) erected at Brussels in the Church of Saint Goule or Gudule in 1622, and also the funeral car for Prince Albert VII, Archduke of Austria. These were designed by Jacques Francquart, architect to the Archduke Albert and Isabella (1577–1670). Barnabé Guimard, who, according to Godghebuer, resided at Brussels from 1765 to 1786, and then suddenly disappeared, leaving "not a wrack behind," designed the Parc quarter of the city, including the Place Royale, the Palais de la Nation and the Ministries. A plan borrowed from the archives of the kingdom shows the Place Royale as executed, with the original design for the Church of Saint Jacques-sur-Candenberg, which latter was, however, constructed between 1738 and 1785, according to new plans prepared by Guimard, and approved by Montoyer, the court architect.

The City of Bruges contributes only one design by J. B. De Noter, lent by the Comte de Beauffort, representing the palace at Bruges, of the Comtes de Flandre about the year 1500.

Antwerp, on the contrary, contributes ninety objects, including a plan of the city in the sixteenth century, lent by M. G. Saintenoy, and an engraving of the ancient Hôtel de Ville, after a painting by Mostart, lent by the Comte de Beauffort. The Jesuit's house at Antwerp is represented by a general plan bearing the inscription "Planographia Domus profess. S. J. Antv.," a plan on parchment by Huyssens or Hegio, dated 1649, the main frontage of the church attributed to Rubens, and several other drawings. J. B. Van

Coukere, the elder, was represented by several ecclesiastical details, including the design for an altar to Ignatius Loyola, which however, bears the name of Rubens, but it is thought that this has been added subsequently without reason. Works by three generations of Walter Pompe was collected. The first was born at Lith in North Brabant, and died at Antwerp in 1777. Like most sculptors of the period, he was also an architect, his numerous works being distinguished by great artistic taste. It appears that during the rigorous winters of 1725, 1740 and 1772 he made colossal figures and groups of snow in several streets and courts. His works shown, belonging to M. Mertens, of Antwerp, are all designs for altars. Several bold and artistic designs, by Paulus Tredeman, for various articles of furniture, many of which were executed, were borrowed from the old Steen Museum, Antwerp, which we are glad to learn will not be destroyed, as it was at one time feared would be necessary, on account of the new river wall.

The principal contribution of the Ghent Municipality consists of more than two hundred plans, accompanying applications for permission to build between the years 1685 and 1800. This collection is all the more valuable because Ghent and Tournai are the only two towns in which these plans have been preserved. It is interesting to watch the progress of architectural drawing and the various methods of treatment. At first the openings of the windows are left white; then in 1734, the roofs are colored green, afterwards blue, and green again, fashion changing in drawing as in all else. About 1747, the draughtsman began to darken the openings of the windows so as to set off the details of their elevations, and at length in 1760, the roofs are darkened, and the openings of the windows are made a dead black, only however, to become lighter again subsequently. But it is not so interesting to observe that, as the drawing becomes more effective, the architecture degenerates. At first there is the Ghent treatment of the Flemish style in the sixteenth century, then the Flemish decadence, increasing in poor effects down to 1760, and then again improving under the influence of the Louis XVI style, No. 215, a house in the Rue de Bruxelles, dated 1765, and No. 258, a house in the Rue de Bruges, dated 1780, may be pointed out as good specimens. No. 305 is a plan for the construction of the Corps de Garde, Place d'Armes in 1738. No. 308 is the plan of a theatre, built in the Marché de Vendredi for the distribution of prizes on the occasion of the exhibition of 1820. Jacob Colin and the two Engels are also represented.

The most remarkable object in the contribution of the Liége Municipality is a water-color design by Delcour, representing the old Cathedral of Saint Lambert in that city. The nave dates from the twelfth century, while the aisles and towers are in the style of the sixteenth century. This building is now unfortunately destroyed. The plans for the Theatre Royal of Liége, drawn by Auguste Duckers (born 1792), were approved in 1817; and these bear considerable resemblance to those, by the same architect, for the Hague Theatre, passed in the following year.

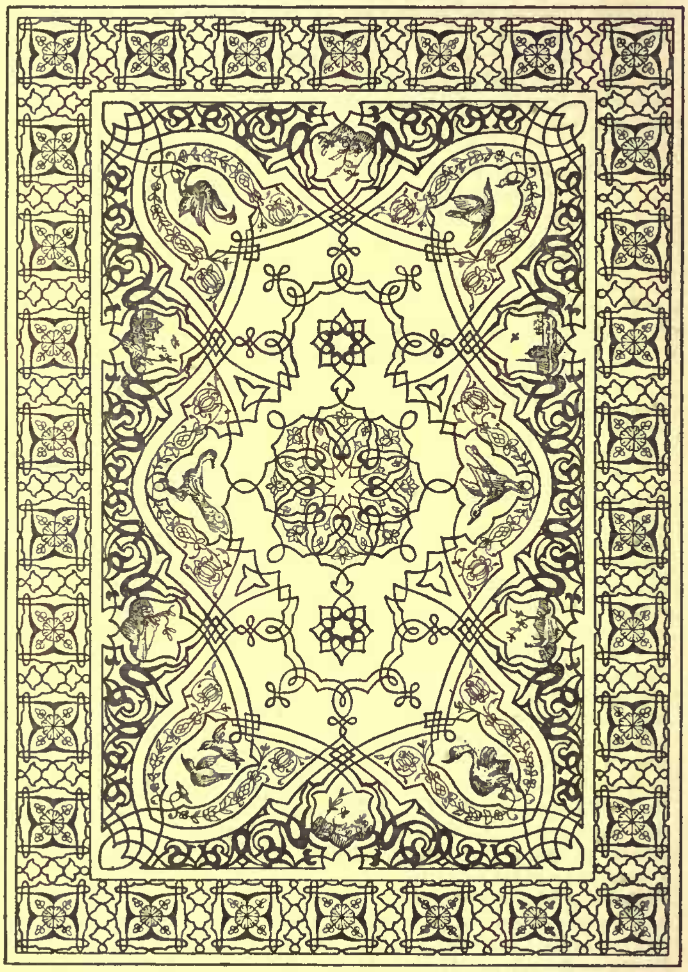
The most interesting contribution from the City of Mechlin is a design by Jean Baptiste De Noter, representing the cabinet of Cardinal Granvelle, and belonging to Count Leopold de Beauffort.

There is a curious old plan, taken from the general archives of the kingdom, representing the course of the river Scheldt through Tournai in 1622. One drawing shows the Belfry of the town before it was destroyed by fire in 1391, and another the same building as restored. It appears that the Belfry was erected in consequence of a charter granted to the inhabitants in 1187, by Philip Augustus, permitting them to have a "Ban-Cloque" in consequence of the enfranchisement of the commune. The section of the tower was almost square, but with cylindrical counterforts at the angles from base to summit. According to Li Muissis the tower was strengthened in 1294, by the addition of four large counterforts connected by pointed arches sustaining the first gallery, while at the same time it was surmounted by the high-pitched roof which figures on the seal of the commune affixed to the charters of 1370 and 1371. After being destroyed by the fire of 1391, which melted all the bells, the Belfry was immediately rebuilt on the same plan under the direction of Maitre Colars Calliel, the work being begun in 1396, and finished in one hundred and twenty weeks. There were two crenellated galleries, with a gargoyle in the middle of each side; and the lantern of the roof was crowned by gables, the spire being octagonal and carrying a brass dragon eight feet long. The tower remained intact till 1781, when the crenellated balustrade was replaced by one of iron. Having fallen into decay, the Belfry was restored between 1849 and 1872, a great deal of the early work being preserved.

From the town of Ypres come several designs for the "Nieuw Werk," or new portion of the Public Market; though roughly executed, they are practical and give details admirably. It appears that so early as 1575, a competition was opened for a design of the "new work," and for a staircase giving access to the Cloth Hall. Jan Sporeman, of Ghent, began a project, but owing to religious and military troubles, the works remained in abeyance until 1606, when a commission was appointed, which disapproved of the plans. Finally in 1611, the design of the brothers De Boek was approved for the "new work," and that of Joris Henckel for the staircase. Nothing, however, was done till 1618, when it was decided to carry out an old plan found in the archives, and copied by Liévin Pluvion, the work being completed about 1624. Several drawings by A. Bohm, of remarkably fine, yet effective execution, are borrowed from the Commercial Museum of Ypres. Many of these, together with some old designs exhibited, bear the distinguishing mark of the architecture of this old Flemish town, viz., a *trilobe* in the gables.

The Château de la Motte in the Province of Brabant, represented by a series of photographs, is the finest specimen in Belgium of the Louis XV style; but it is now fast going to decay, though the chapel is still in a fair state of preservation. Comparatively little known, this old edifice merits attention, and should certainly be restored by the Government. It was constructed a little more than a century ago on the top of a hill, and afforded a capital view of the valley of the Cala. The delicate sculpturings of the interior were gilded and relieved by azure filets. J. W. P.

A PERSIAN CEILING.



THE ceiling, except in the instance of palaces and mansions of the first class, has been hitherto a very large space with corresponding opportunities more or less neglected by our principal architectural decorators; and even when largely utilized for ornamental purposes it must be confessed that the results have rarely been such as to fully satisfy a true and pure æsthetic taste.

We give in our initial cut an illustration of what appears to be a somewhat remarkable and new departure in this direction, however, and one worthy of more than a passing notice. The design referred to is one for a ceiling in the Persian style of decoration, and it emanates from the Studio of Arabian and Persian Art recently opened at 151 High Street, Nottinghill-gate, London, W., under the able management of Mr. M. Hakoumian, who has been so fortunate as to secure the services of one who is emphatically a born artist — Sepon Bezirdjian — to whom was entrusted the flattering and honorable task of designing the whole of the magnificent ornamentation, decoration and furniture of the Imperial palaces and residences of the Sultan Abd-ul-Assiz at Constantinople. Asiatic decoration, in its best and purest phases, is not yet greatly known, and still less is it popularly understood in this country; and in the beautiful Persian ceiling we give in our present issue we have a highly instructive, suggestive, and eminently satisfactory type of what can be accomplished in this direction by a true and richly-inventive artist, who uses colors and forms as freely as a great poet does words and metres, and so blends an infinitude of rich devices as to compel the whole to produce a true chromatic harmony, which strikes on the eyes of the observer in very much the same way, and with as pleasing an effect as the sweetest music does on the attentive ear.

We have said *colors.* It must be observed that to fully realize and properly appreciate this design, which we here show, it must be borne in mind that it is to be produced in colors — as might be inferred, we think, by a careful examination of the design. Two main points present themselves, we think, in carefully criticising this original and splendid work: one is that, as a whole, there is the most complete

co-ordination of each detail to the prevailing spirit of the whole conception, and the other is that, although rich in color as the rainbow, as an oriental garden itself — whence was taken, indeed, the types of the flowers and birds represented — the effect, in its totality, is beautifully subdued, so that in no one item, in no particular incident in all the wealth of illustration that has been lavished on the work, do we find anything in the least obtrusive, still less gaudy or bizarre.

This entire harmony of all detail to the main *motif* of the artist's design is, of course, the distinctive mark of first-rate work; and it once more illustrates the great cardinal truth, that the greatest artists are the best masters of *proportion*, and do not seek to carry by storm, so to speak, the admiration of the beholder by tremendous isolated efforts, which, after all, please only for a moment, but prefer to evince the even calm, the conscious might of supreme mastery over the materials at their command. Thence we get the *finished* effect of a poem, perfect alike in inspiration, central idea, accessory treatment, and verbal music. The Persian ceiling here shown is in all ways typical. It includes, we think, the beauties of the more or less geometrical character of pure Arabian decoration, and includes the additional interest of a liberal admixture of the living aspects of nature. Flowers and birds are seen in profusion, while the artist has cunningly introduced a number of charming architectural sketches, which are all well worthy of individual examination. The entire work is undoubtedly one of very great merit, and produced in all the bright and living hues of an Eastern world of light and life, of melody and joy, such as scarcely enter into the normal conception of the Western mind. We can commend this new departure to those among us who feel disposed to give a fair trial to the pure Asiatic style of interior decoration. — *Building World.*

SOCIETIES

THE Architectural League of New York is with sorrow called upon to record the loss of a gifted and promising member, Frederick B. White, whose high ideals and singularly bright and attractive nature had earned for him the respect and attention of those who knew him. While yet a student at Princeton College, and without any special architectural training, he gave indications of unusual fitness for the profession he chose, and into the independent practice of which circumstances forced him at an earlier age than he would himself perhaps have chosen.

At the age of but twenty-five, and only three years after he had bid adieu to his *alma mater*, he had already designed and executed, besides many smaller buildings, a number of more important works, the excellent qualities of which seemed to promise a brilliant future. In his death the profession loses a practitioner who took a serious and lofty view of his art, and the League a brilliant member.

The Architectural League desires to express its sincere sympathy with Mr. White's family in their bereavement.

HENRY O. AVERY, *Chairman of Committee.*

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

A WORD TO SIR EDMUND BECKETT.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Sir Edmund Beckett's lecture as reported in your issue of the 22d ult., doubts all relation between science and art, is feebly uncertain as to the nature of either, and positive only that an architect is not an artist.

Sir Edmund loves not the architect, but instead of saying so bluntly — probably because he has said it too often — he consents to give a reason for his opinion; he says: "An artist must do something with his fingers, he does not work with his mind only; an architect does not do anything with his fingers; he merely makes drawings and tells other people how they are to do the work."

Homer, Wagner, Taglioni and Garrick, none of these artists, think of it, because they did nothing with their fingers, and poor blind Milton, surely he was not an artist, for he did not even do his own writing!

Sir Edmund has his doubts whether hairdressers, singers and actors are artists, but believes that tailors are, "because they produce excellent results, more successful results than architects generally."

I fully share Sir Edmund's apprehension that "the meaning of the words science and art are less understood than they should be," and being an architect and hence interested to make him more civil hereafter, I must proffer a few hints on the subjects of science and art and their relation.

Science, Sir Edmund says, "is merely a fine word for knowledge." This is meant to be cynical, but is only superficial. Science may be said to be a species of knowledge, but knowledge is not necessarily science. If I know that my neighbor is rude and overbearing, superficial and not profound, that is knowledge but not in any sense science. Knowledge pertains to all sorts of facts. Science only to the phenomena of nature. Knowledge accepts testimony of all kinds, science relies solely upon properly guarded experiments, crucial tests and quantitative analysis by mathematical reasoning. Science ascertains the laws of nature, or the invariable recurrence of phenomena under given conditions, knowledge deals with facts natural or artificial, related or not. For instance, the fact that Napoleon Bonaparte was beaten at Waterloo is a matter of knowledge or historical fact. We know it because of the testimony of others. We cannot and do not attempt to prove it. It is not as Sir Edmund imagines, a matter of science. History is not science.

Sir Edmund heard Mr. Faraday say, within his hearing, that the nature of electricity was unknown to him, and is greatly surprised thereat. Perhaps I can surprise him more by telling him that no one pretends to know the nature of electricity, although many of its functions have been scientifically ascertained. Sir Edmund has evidently heard something of the correlation of forces and their convertibility which is a matter of pure science, but prefers to harp upon what somebody said about all force being alike, that gravity is heat, heat is electricity, and everything is everything else.

Sir Edmund believes in mathematics, or, as he expresses it, in the multiplication-table, in triangles and linear perspective; this confession is consoling and would be proof of a remnant of good nature did it not wind up with the growl that some artists know nothing of perspective. Of course they don't, and so some lecturers know nothing of science and art nor of their relation, and some architects know nothing of construction; but this is no reason why the architects of England who count among their number many of the most eminent members of their profession should be spoken of disrespectfully by an Englishman. Yes, disrespectfully, sneeringly. "For some reason," Sir Edmund says, "architects wish to call themselves artists; I have never been able to make out why."

I can tell him why! Because he knows nothing of the nature of art.

His scanty definition of art is that it is uncertain! Uncertain in what? In its principles, in its purposes, or in its results? Not in either of these: it is an uncertain quantity merely in the mind of the lecturer, a thing which certainly exists, but he knows not what it is. Let us tell him.

Art is a faculty by which man creates material organisms in imitation of nature, which are intended to perform a function, or by which he depicts an idea in words, in music or stone, or in painting, or in a structure. The former is mechanic art, done by artisans, the latter fine art, done by artists.

When an architect builds a church, a parliament house, a library, a school-house or a dwelling, and gives to it an expression which clearly defines not only its purpose but also the idea connected with the same so that any passer-by of measurable intelligence can recognize the idea as being well and forcibly expressed, this architect is an artist. Now, to do this the architect must be familiar with the language by which ideas are expressed in a structure — this language is building. Construction is a science purely mathematical, hence the relation of science and art in architecture.

The combination of sounds in music, known as musical composition, is also a mathematical method of expressing an idea, and is a notable instance of an intimate relation of science and art, and a composer of music when he has written a successful score which, when performed, conveys an idea to an audience, is an artist.

The relations of science to the mechanic arts need not to be enlarged upon here; it is a subject your readers are familiar with.

It seems a bold step to give way to pessimism in the presence of young students on serious subjects such as science and art without reflection, and it is dangerous to belittle the influences of science and art upon each other when both are the most potent mental motors of human civilization, and hence more or less factors in all human efforts. It is not just (to say nothing of civility) to speak sneeringly of a whole profession, no matter what the shortcomings of its individual members, and if we may judge from this lecture, of the temper of the lecturer in his relation with ideas, with men and things, we must feel inclined in a matter of difference between Sir Edmund Beckett and architects collectively or individually to give the benefit of the doubt to the architects. LEOPOLD EIDLITZ.

THE OWNERSHIP OF DRAWINGS.

SAN FRANCISCO, CAL., June 4, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— I have been endeavoring to find a decision made by some of our courts in regard to who has the ownership of the plans and specifications after the completion of a building, whether the architect or owner. I have been unable to find anything touching on this point, and have been referred to you as likely to know if any such a decision has ever been rendered. If you know of such a decision you will greatly oblige me by giving me the title of the ease and the court and time it was rendered.

Yours very respectfully, W. H. MAHONY.

[WE refer our correspondent to the answer we made to a similar question in our issue for January 17, 1885.— EDS. AMERICAN ARCHITECT.]

THE PROVIDENCE RAILROAD STATION.

Cleveland, O., June 18, 1886.

To the Editors of the American Architect: —

Dear Sirs,— I am but a very recent subscriber to your elegant paper, but in the number just at hand I notice a railroad station at Providence which I do not think is a fair example of our best work in that direction, and it has occurred to me to ask you to illustrate occasionally the best type of urban and suburban stations on our railroads, both in this country and in Europe.

Respectfully, Aug. Mordecia.

[If our correspondent had read his paper and not merely looked at the pictures he would have discovered that the view of the Providence railroad station was not published "as a fair example of our best work in that direction." — Eds. American Architect.]

NOTES AND CLIPPINGS

Archæological Discovery at Jerusalem. — Professor Hayter Lewis, who has just returned to England from Jerusalem, brings the news that the finding of the wall north of the "Citadel" in the Holy City promises to be a discovery of the very highest importance. The wall is from eight to ten feet thick; it is built of masonry exactly similar to that in the lower courses of David's Tower, that is, of large stones with the well-known and characteristic marginal drift; and there is a deep rock scarp at its foot. "These circumstances," says the *Athenæum* "point very strongly to the presumption that there is here the long-lost second wall. It is most desirable that the discovery should be followed up as soon as possible, though difficulties may arise from the presence of houses. How important it is may be gathered from the single fact that if the wall runs *outside* the Church of the Holy Sepulchre, and if it be accepted as the second wall, all the sites covered by that venerable church are thereby proved, and must be acknowledged to be false. But, in any case, the tradition that here Constantine raised his basilica, and surrounded the supposed site of the Holy Tomb with columns, will remain undisturbed.

Dynamite Statistics. — Dynamite is more and more in use — for lawful purposes, happily even more than in furtherance of the objects of Fenians or Anarchists. If we include in it cognate explosive substances, it has become a very great fact. Three government inspectors watch it. A large number of manufacturers make it. Its behavior is the subject of more than one act of Parliament, and the accidents by reason of it are detailed in a Blue-Book just issued, containing the annual report of Colonel Majendie and his assistant inspector of explosives, which is well calculated to make one feel that the use of such powerful agencies has sensibly increased the perils of life. Twenty years ago all such substances were of little account. Excepting gunpowder they were curiosities, scarcely known outside the laboratory. But of late the trade in explosives has wonderfully expanded. The factories for the manufacture have doubled in 10 years; the magazines for the storage are 75 per cent more than they were in 1875, and the retail premises exceed by 9,000 what they were in that year. We make more and we import more of such substances, and there is every sign that the trade is only in its infancy. Every year, too, additions are being made to the recognized explosives. Within the last year several have been added to the authorized list, one being electric detonator fuses, consisting of electric fuses with platinum wire imbedded in a charge of a priming composition made of carefully-purified gun-cotton. Some new forms of gun-cotton, such as tonite and potentite, find favor. Compressed gunpowder cartridges are superseding in mining loose gunpowder, and, being safe to handle, they hold their own against the nitro compounds. The brown gunpowder called "cocoa" powder, is, as every one knows, much used here, as well as in Germany. But the tendency is to develop the nitro-glycerine group of explosives. For sporting purposes Schultze powder, a nitro compound, consisting of nitro-lignin carefully purified and mixed with a nitrate, is employed. For some time back the use of nitro-glycerine as a medicine in cases of angina pectoris and similar diseases has been recognized by the British Pharmacopœia.— *London Times.*

A Man who would have Everything according to Contract.— From the somewhat indefinite era of the man who builded his house upon the sand previous to the rainy season, there has been a continuous wail going up from the unfortunate people in every community who "are building." It is a tale of worriment, of estimates exceeded and exasperations endless. It is reassuring then, to find, at least, one man who was too much for the wicked contractor, and built his house not only upon a rock, but like a rock so that it shall stand until some elevated railroad of the future gets the right of way through its second story. Thus saith the man who beat the contractors at their own game: "People can't be too careful when they are building, for those who don't know what is what in the way of work and material are systematically taken in by the contractors. The architect is supposed to see that the contracts are carried out, but he can't always be on hand, and when a dispute does arise he naturally leans toward the mechanics. Many of the inexplicable fires that occur in first-class dwellings are simply the result of criminal carelessness and fraud on the part of workmen and contractors. I had a running fight while my house was building, but it was done as I wanted it and according to contract. The party-wall was twelve inches wide and bricks were to be bonded every five courses. I went to look at it one evening when the wall was twelve feet high and found only every twentieth course was bonded. Some workmen were going by on their way home. I hired them for an hour. We transformed a big beam into a battering-ram, and when my friends, the contractors came back in the morning they found their wall lying in the cellar bottom. From that time on every fifth course was bonded, according to the specifications. Then we began on the framing. I had distinctly specified that the flues in the walls should be spanned. One afternoon I climbed on to the upper floor beams and found a burned and sooty brick lying on the scaffolding. It had been taken out of the wall of my neighbor on the right, to let one of my floor beams in.

"'Look here,' said I to the German who was doing the framing, 'you've run that beam plumb into a furnace flue. Some cold winter night I'll wake up and find my house afire.'

"'Can't help dot,' replied this original Buddensiek.

"'Well, I can,' said I, and I got a piece of timber and began to pry the beam out.

"'Here! Vot der Teufel!' shouted the contractor; 'you stop dot!'

"'Get out of the way!' I yelled, 'or you'll go where the good Germans go all before your time!'

"He grabbed an adze and jumped for me. I seized an axe and began counter demonstrations. Then, while he sat down to think it over, I sat down on the end of my lever. Up came the floor-beam out of its mortise, and went crashing down into the cellar. It had protruded four inches into what would have been a red-hot flue when the furnace was working well.

"Things went smoothly after that until we came to putting in the furnace. I had ordered double tin pipes and double pipe-guards wherever a partition was pierced. One afternoon I came in and found two apprentices lathing up a partition about a furnace pipe. I asked if the double pipe-guards had been put in. They winked at one another and said, yes. After they had gone I cut a little hole with a hatchet and investigated. Not a sign of a guard, double or single, was to be found. It didn't take long for me to rip that all out. I told the head lather to get somebody other than those two apprentices to do the work; for if they ever entered my house again I'd make him throw up his contract, and if he sued me I'd fight him as long as I had a dollar left. The furnace-builder also wore an unhappy look after I had finished with him. Well, the house is finished, as you see, and it only cost $170 more than the original estimate. The excess was due to the building of a stone wall for the yard instead of a fence, as originally intended, and the construction of coal-bins, which I had forgotten to include in the original estimate."

If others would be as careful and energetic as this man, there would be no chance for builders of the Buddensiek type.—*N. Y. Tribune.*

TRADE SURVEYS

Prices are strong in all markets for crude and manufactured products, even when demand is behind its average. There is almost everywhere a feeling of confidence in a good autumn trade and good prices. The past few days have furnished evidences of continued improvement in the tone of the markets throughout the country. There are more reasons for saying again what has so often been said before, that in building-channels work will be abundant. A leading building authority in Chicago, and another in Minneapolis, said, quite recently, in substance, that all excuses as well as reasons for delay had been supplanted with urgent demands for more house and shop room. The list of building permits in Western cities is evidence of improvement. Municipal enterprise is supplementing that of individuals in a good many smaller cities and towns. Strikes have been very generally settled in the building trade. The ten-hour day has gained ground. Building material is firm in price. Brick is scarce at Philadelphia, Chicago, and at one or two other points. Lumber is abundant, but is very firmly held. Coast-wise freight rates are weakening, on account of the rush of coal vessels for lumber. The lumber-yards all along the Atlantic coast have been very well supplied, with Southern lumber, especially. Builders have delayed their heavy buying, but now evidently feel assured that rates will hold. White pine has been moving sluggishly in several markets. Hemlock is plenty. Considerable spruce has been shipped from Maine ports. The hardwoods are in moderate supply and command full prices. Saw and planing mill managers have fair orders, but competition is working to the disadvantage of mills remote from lumber sources. Wood-working machinery has been quiet; the industry is, however, very well equipped, and the large Western manufacturers are counting upon a return of the activity which was the basis of their bright reports a few weeks ago. The iron trade is dull in some branches, such as in pigs, bars, sheets, and plates, but very active in skelp-iron, wrought-iron, pipe and steel rails. Great activity will be inaugurated in railroad building, and all the mills are crowding rails to points of delivery. Over three hundred thousand tons will be delivered during the coming quarter. Contracts were placed at mills this week for twenty-five thousand tons, and inquiries are in hand for sixty thousand tons. An active demand is near at hand for Bessemer pig. Railway-material capacity is being increased by the addition of a large and most completely-equipped mill in western Pennsylvania, and schemes are entertained for a further expansion of producing-capacity. Railroad builders have been recently encouraged by the liberality of money-lenders, and material-men are beginning to feel that the coming year will be a very good one for them, because of the increasing confidence and the improving management displayed by railroad interests. The iron, coal, lumber, and the machinery-manufacturing interests, as well as the building interests, are all exercising commendable caution in the matter of production. Money-lenders are aiding to keep the conditions of trade healthy. With labor-agitations in the rear, and consumptive requirements expanding, there is reason for congratulation. Coal production is between three and four million tons ahead of last year, and iron production is away ahead. Organized labor has put its foot on striking, and the public awaits to see if it can control. The dry trade and financial statistics of the great centres of commercial activity contain nothing from which disquieting conclusions can be drawn. The speculative fever is at a low ebb. Capital has become tired of awaiting opportunities for cornering; legitimate enterprise controls. The volume of business does not grow rapidly, but it is a legitimate expansion. Congress has not disregarded what it believes to be the public sentiment concerning legislation affecting business interests. Capital is not hanging back from profitable investments. Railroad managers are losing no opportunity to strengthen the alliances for a perpetuation of friendly relations. Schemes for fresh railroad-building enterprises are cordially entertained. The spirit of enterprise is not sleeping, but everywhere men are ready for opportunities, and no opportunity goes a-begging.

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THE PRODUCE EXCHANGE, NEW YORK, N. Y.

GEORGE B. POST, Architect.

HELIOTYPE PRINTING CO., BOSTON.

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